Fact Sheet

Triclosan: What the Research Shows

A joint project of **Food & Water Watch** *and* **Beyond Pesticides**

A growing list of household and personal care products are advertised as "antibacterial" because they contain a chemical called triclosan. While the manufacturers of these products want you to think triclosan protects you from harmful bacteria, it turns out that it may be doing more harm than good.

Here is a summary of research from 60 studies on how triclosan impacts human health and the environment.

Body Burden

Triclosan exposure has become so common that it has shown up in the blood,[1] urine[2] and breast milk[3] of people across the globe. While people who use triclosan products daily have higher levels of the chemical in their bodies, even consumers who do not use triclosan on their skin are exposed to it through food, water, and even household dust.[4]

Researchers from the CDC have found that people in their 3rd decade of life have the highest levels of triclosan in their bodies.[5] A study of triclosan levels in the blood of Australians confirms that the 31-45 year old age group had the highest levels of triclosan.[6] Overall, though, the researchers noted that triclosan levels were startlingly homogenous. "The most remarkable feature of the dataset was its homogeneity. No highly exposed or low-exposure subgroups were identified."[7] Interestingly, women in Australia have levels of triclosan twice as high as women in Sweden. A Swedish warning statement in 2000 encouraging consumers to avoid the use of antibacterial products with triclosan may be a contributing factor.

Health Concerns

A number of recent studies lead to concerns that triclosan is an endocrine disruptor. Two new laboratory studies, on rats and frogs, demonstrate that triclosan can disrupt thyroid hormone.[8] In the frog study, researchers found that tadpoles treated with low levels of triclosan have altered thyroid hormone-mediated development. Exposure to triclosan also disrupts thyroid hormone-associated gene expression.[9] A study by British researchers found that triclosan has estrogenic and androgenic hormone properties, and exposure could potentially contribute to the development of breast cancer.[10]

Researchers at UC Davis found that triclosan elevates calcium levels in cells, which can potentially affect neurodevelopment and neurological function.[11] Triclosan has also been shown to impair mitochondrial function in mammalian cells.[12]

Resistance Concerns and Efficacy

Two review articles summarizing the literature on resistance and efficacy of triclosan came to the same conclusion: there is a public health risk of bacteria

becoming cross-resistant to triclosan and antibiotics.[13] One study also concludes that, for consumer use, triclosan has no added health benefits over soap and water. The researchers conclude, "The results of our review call into question the marketing of soaps containing triclosan as a product providing efficacy beyond the use of plain soap in the community setting... Current findings warrant actions by the FDA for evaluating consumer product advertising claims."[14]

In a risk assessment by the Norwegian Scientific Committee for Food Safety, experts concluded: "Widespread use of triclosan, including use in cosmetic products, selects for development of triclosan resistance. Since this may contribute to the development and spread of concomitant resistance to clinically important antimicrobial agents, such use represents a public health risk. Therefore, the use of triclosan should be restricted."[15]

Environmental Concerns

Triclosan is toxic to algae,[16] phytoplankton,[17] and other aquatic life. Because triclosan's mode of action is to inhibit fatty acid synthesis in bacteria, and because bacteria and plants have similar fatty acid biosynthesis pathways, triclosan may also have inhibitory effects on plants.[18] Triclosan has also been shown to have genotoxic and cytotoxic effects in algae.[19] Triclosan is lipophilic, and has been found to bioaccumulate in earthworms,[20] algae,[21] and other organisms. Researchers are concerned that it will accumulate and spread through aquatic and terrestrial food webs.[22]

Triclosan has also been found to have additive and even synergistic effects when combined with other common contaminants of waterways, potentially making triclosan more toxic to aquatic organisms when multiple pollutants are in waterways, as is often the case.[23] One study found that a mixture of low environmentally relevant concentrations of 12 commonly used antibacterial agents significantly inhibits algal growth, including a level of triclosan that is well below the concentration that produced no observed effect.[24]

Environmental Fate of Triclosan

Products that contain triclosan wash down our drains and into water systems and waterways, where triclosan has become a common contaminant. Sewer overflows and wastewater effluent deposits both contribute to triclosan contamination of waterways. A major source of triclosan in waterways is sewage sludge. Triclosan accumulates in sewage sludge from municipal wastewater treatments.[25] The sewage sludge is spread on land, and triclosan leaches down through the soil[26] and runs off into surface water from the fields.[27] Concentrations of triclosan in runoff have been found to be at levels above what was shown to alter thyroid-mediated gene expression and development in frogs.[28] Triclosan was detected in runoff from treated fields as long as 266 days after the biosolid application.[29]

Triclosan has also been shown to persist in sediment for long periods of time. One study of sediment cores near wastewater treatment plants led the authors to state, "Triclosan concentrations in sediments show no significant evidence of degradation within the first few years after deposition."[30]

Surprisingly, triclosan also persists in the home. A 2007 study looking at indoor dust samples found triclosan present in all samples of dust from private homes, and in surprisingly large amounts. "The average value (702 ng/g) was not far from the microgram per gram range, which is the typical level reported for this compound in sludge."

Breakdown Products

Numerous studies have shown that triclosan, when exposed to sunlight, and when interacting with chemicals such as chlorine in tap water, degrades into toxic breakdown and intermediate products. The most commonly detected chemical breakdown products and metabolites of triclosan include:

- **2,8-Dichlorodibenzo-*p*-dioxin (2,8-DCDD):** a type of dioxin. Researchers in the UK and Japan found that close to 1 percent of triclosan is converted to 2,8-DCDD when photodegraded, and that the 2,8-DCDD actually persists longer than triclosan.[31] 2,8-DCDD was also found to be a toxic intermediate

product when triclosan degrades in surface waters,[32] on fiber coatings,[33] and in real contaminated wastewater samples.[34]

- **2,4-Dichlorophenol (2,4-DCP):** an endocrine disruptor and a U.S. EPA priority pollutant. Detected by researchers in Spain and Cuba studying the degradation of triclosan in the presence of low levels of chlorine.[35] Confirmed in studies by researchers at Virginia Polytechnic[36] and University of Minnesota.[37] Also confirmed in real wastewater samples.[38]
- **2,4,6-trichlorophenol (2,4,6-TCP):** an endocrine disruptor. Detected by researchers in Spain and Cuba studying the degradation of triclosan in the presence of low levels of chlorine.[39] Confirmed in studies by researchers at Virginia Polytechnic.[40]
- **Chloroform:** a carcinogen. Researchers at Virginia Polytechnic found that chloroform is created when triclosan reacts with free chlorine in tap water, and that, in some circumstances, it occurs in levels above the U.S. EPA Maximum Contaminant Levels for chloroform in drinking water.[41] The researchers stated, "...The potential exists for substantial chloroform production to occur via daily household use of triclosan-containing products."[42]
- **Methyl Triclosan:** a metabolite of triclosan. Bioaccumulates in algae[43] and grass shrimp.[44] Has been found to be more bioaccumulative than triclosan.[45] One study concluded, "...Triclosan and methyl triclosan have been identified as two of the major pollutants that currently contribute to the acute toxicity of domestic wastewater."[46]

What You Can Do

With all of these questions about what triclosan is doing to the environment and our health, it's time to question whether it belongs in products we use every day. Beyond Pesticides and Food & Water Watch want the Food and Drug Administration to get triclosan out of consumer products. Contact us to find out how you can help in this effort and how to get schools, religious institutions and government agencies in your community to switch to ticlosan-free products.

Endnotes

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About Food & Water Watch

Food & Water Watch is a nonprofit consumer organization that works to ensure clean water and safe food in the United States and around the world. We challenge the corporate control and abuse of our food and water resources by empowering people to take action and by transforming the public consciousness about what we eat and drink.

About Beyond Pesticides

Beyond Pesticides (formerly National Coalition Against the Misuse of Pesticides) works with allies in protecting public health and the environment to lead the transition to a world free of toxic pesticides.

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