

Health Risks & Environmental Issues
Triclosan – A Controversial Antibacterial
by Rose Marie Williams, MA



Triclosan is a chlorinated aromatic compound with antibacterial properties, as well as antifungal and antiviral properties. It goes by the trade name, Microban[®], when used in plastics and clothing, and as Biofresh[®] when used in acrylic fibers. The companies that manufacture and use triclosan claim it is safe. However, it is registered as a pesticide with the United States Environmental Protection Agency (EPA). Pesticides are chemicals designed to kill some life form. The EPA considers triclosan a high risk for human health and the environment. When introduced in 1972, triclosan was confined to health care settings in a surgical scrub.¹⁻⁴

Triclosan may not be a familiar term to most consumers, though it is now ubiquitous in most American households, masquerading under the unassuming term, "antimicrobial." In the United States, "antimicrobial" has become synonymous with cleanliness and good health. The chemical industry has fostered a fear of germs among American consumers and developed a lucrative market selling products designed to protect us from germs. The EPA estimates sales of antimicrobial products now constitute a billion dollar per year industry.⁵

As an antibacterial, triclosan is added to numerous consumer goods. It is commonly found in detergents, dishwashing liquids, kitchen sponges, soaps, deodorants, cosmetics, lotions, antimicrobial creams, acne medications, skin cleansers, toothpaste, mouthwashes, various plastics including children's toys, paint, wallpaper, flooring, textiles, curtains, sandal foot beds, public railings, keyboards, countertops, faucets, even dog bowls. It is being added to an increased number of consumer products including kitchen utensils, cutting boards, socks, and trash bags.^{1,3,5-8}

Linens are now being targeted for the antimicrobial treatment. "Consumers are really demanding it," claims Billy Henry, president of Microban International of Charlotte, North Carolina. While the EPA prevents manufacturers from making

health-related claims about killing germs, it does allow the word, microbes, to be used in advertising. Consumers would certainly enjoy the benefit of preventing mildew odor on damp towels, but might not be so easily seduced if fully cognizant of the health risks associated with exposure to the controversial chemical.⁵

Health Risks

Triclosan is a chlorophenol, a class of chemicals suspected of causing cancer in humans. A variety of skin irritations can result from phenol exposure, but since phenols are capable of deactivating sensory nerve endings, the normal warning signs from pain may not be present. There have been reports of individuals developing contact dermatitis (skin irritation). There has been some evidence also that triclosan can cause photoallergic contact dermatitis (PACD), which occurs when skin exposed to triclosan has also been exposed to sunlight. A rash may result on the face, neck, back of hands, or sun-exposed areas of the arms. Will health providers be advised to ask patients with these symptoms if they are using antimicrobial treated linens? Probably not.^{2,3}

Triclosan can interfere with the body's thyroid hormone metabolism, lowering body temperature and causing a "non-specific depressant effect on the central nervous system" of mice.²

Symptoms of internal exposure, even in small amounts, may include cold sweats, circulatory collapse, convulsions, coma, and death. Long-term and repeated exposure to many pesticide products can damage the liver, kidneys, heart, and lungs and cause paralysis, sterility, brain hemorrhages, hormonal disruption, and immune suppression.^{3,4}

The chemical structure of triclosan resembles certain estrogens. One study on a species of Japanese fish did not indicate any estrogenic effects, but found androgenic effects resulting in changes in fin length and sex ratios.²

Triclosan is lipophilic, attaching to fatty tissue. It can accumulate in the liver, lungs, and kidneys, reaching toxic levels. As a chlorophenol, it is categorized as a persistent organic pollutant, along with dioxins and PCBs. These chemicals persist in the environment and bioaccumulate up the food chain. Being at the top of the food chain, humans harbor the most concentrated amounts of these toxic chemicals.²⁻⁴

Triclosan's use is already so widespread it has made its way into the human body. Studies show triclosan residues in the umbilical cord blood of infants and in the breast milk of nursing mothers.⁹ Triclosan has not been thoroughly tested nor evaluated for potential risks to human health and the environment though it is in a category of very toxic and carcinogenic chemicals. It is chemically similar to Agent Orange.^{3,4}

Not All Germs are Bad

Multiple exposures from daily encounters with a strong antibiotic agent such as triclosan is being questioned by many health proponents. Antimicrobials kill off the good bacteria along with the bad, while increasing health risks to host organisms, including plants, animals, and humans. We are finally recognizing the important role of friendly bacteria. Such bacteria are needed for their beneficial effects of aiding metabolism to protect against harmful pathogens.³

Wide use of antimicrobials and disinfectants can lead to genetic mutations, creating drug-resistant bacteria and mutant viruses for which the human immune system remains defenseless. Studies indicate that people exposed to a variety of microbes develop stronger immune systems, while individuals who grow up in more sterile environments are more susceptible to respiratory allergies, asthma, and eczema.^{2,3}

A half-century after penicillin was introduced as the greatest wonder drug to kill infectious bacteria, we are now witnessing the emergence of super bugs that are not only resistant to penicillin, but are also resistant to the newer and stronger antibiotics, such as vancomycin.⁶

Antibiotics' ability to save lives is unquestioned. However, the pervasive use of these drugs is creating heretofore unanticipated problems of mutant strains of drug resistant bacteria faster than modern technology is able to contain them. Widespread exposure to antibiotics from multiple prescriptions beginning in early childhood and from a steady diet in the food supply has done little to fortify our immune systems. Antibiotics are routinely added to animal feed to accelerate growth and to combat rampant disease from overcrowded factory farm conditions.

Because triclosan was originally thought to kill all bacteria, the possibility of it contributing to bacteria resistance was not considered. Triclosan soon became the perfect germ-killer, added to soaps and toothpaste for adults and children to protect against infection. As a germ-fearing culture, we embraced this concept wholeheartedly. History may be repeating itself as we begin to learn about new risks associated with triclosan.

Microbiologist, Laura McMurray, PhD, and colleagues at Tufts University School of Medicine in Boston, now believe triclosan may not be so great after all. In lab experiments, they were able to breed mutant strains of bacteria, which could develop resistance to triclosan. Writing in the journal *Nature*, McMurray indicated the possible emergence of triclosan-resistant bacteria, but stressed there is no current evidence that this has already happened. No research has yet "looked for them out in the real world," but she stressed, "there is the potential." McMurray discouraged using triclosan germ-killing products in the home and encouraged fighting germs with ordinary soap and water instead.⁶

Safer alternatives to using antimicrobial soaps include the following:

- frequent and thorough hand washing with regular soap and water, and thorough rinsing,
- washing children's hands and toys frequently,
- using clean towels for drying, and
- frequently washing surfaces that come in contact with food.

Mother Nature has provided some very good antimicrobial products that pose less threat to humans and the environment. Among them are Australian tea tree oil, pine oil, and grapefruit seed extract.²

Dioxin Contamination

The molecular structure of triclosan is similar to dioxins and PCBs, some of the most toxic substances on earth. Its production creates small amounts of residual polychlorinated dioxins and polychlorinated furans, which are contained in small amounts in the products to which triclosan has been added.^{1,2} Besides being highly carcinogenic, dioxins can weaken the immune system, decrease fertility, alter sex hormones, and cause birth defects and miscarriage. Dioxins are formed when triclosan is manufactured and probably when it is incinerated.²

Additionally, small amounts of dioxins and furans are also produced when triclosan reacts with chlorine in tap water. Dioxins are extremely toxic and potent endocrine disruptors that bioaccumulate to dangerous levels and persist in the environment for long periods of time.¹ According to EPA spokesperson, Enesta Jones, the agency is investigating the possible impact of dioxin-like byproducts as part of its review process scheduled for completion in 2007.⁵

Triclosan + Water = A Bad Mix

Nearly all dish liquids now contain triclosan. Consumers who use antibacterial dish liquids believe they are helping themselves and their families stay healthy. It seems this controversial germ-killing agent reacts with chlorinated tap water to form hazardous chloroform as dishes are being washed, according to research conducted at Virginia Polytech Institute and State University. Chloroform is classified as a "probable" carcinogen.⁸

Erick D. Olsen, senior attorney for the Natural Resources Defense Council, believes "there is a very real likelihood that washing dishes with triclosan-containing liquid could cause additional and troubling significant exposure through inhalation and potentially through dermal absorption." Consumers with chlorinated tap water who use triclosan-containing dishwashing products are advised to wear rubber gloves to reduce skin contact, but no one has yet suggested wearing facemasks to reduce inhalation exposure, nor have suggestions been made on how to avoid mucosal absorption from toothpaste use. As in all things, caveat emptor, let the buyer beware. If product labels are unclear about contents, consumers may wish to contact manufacturers to clarify chemical ingredients, or they might simply

choose alternative brands. Consumers without access to a health food store, or with insufficient choices in their supermarket, can obtain safer household and personal care products from N.E.E.D.S. (800-634-1380, www.NEEDS.com).

Environmental Risks

Over 95% of triclosan in consumer products is washed down the drain. Wastewater treatment plants do not remove triclosan from the water. The chemical is highly stable for long periods of time, contaminating our waterways. Triclosan has become one of the most frequently detected compounds in US streams, and in lakes and rivers in Switzerland.²

Triclosan effluents have a negative impact on stream ecosystems, with especially high risks occurring downstream from water treatment facilities. Triclosan's lipophilic nature and resistance to degradation make it readily available for absorption by and bioaccumulation in aquatic organisms. Methyl triclosan, a breakdown product, is actually more lipophilic than the parent compound and, therefore, more bioaccumulative.²

It is likely that triclosan in water exposed to sunlight can also produce dioxins. Consequently, another concern is the potential for dioxin creation when triclosan-tainted chlorinated water is exposed to sunlight at water treatment plants.²

US Regulation is Lax

The US Environmental Protection Agency regulates all pesticidal use of triclosan, including its use as a preservative, fungicide, or biocide, as is the case with Microban[®] used in plastics. When used in soaps, deodorants, creams, and acne medications, triclosan comes under the jurisdiction of the US Food and Drug Administration.²

Hasbro Inc. manufactures Playskool toys made with Microban plastic containing triclosan. In 1997, the company was stopped from making false claims about protecting children from microbial infection, but was allowed to continue using the antimicrobial chemical. In 2000, Denmark issued a warning against the routine use of antibacterial household and personal care products, emphasizing they "are extremely persistent and highly toxic in the marine environment." Finland also urged consumers to avoid certain antibacterial chemicals. Germany's environmental minister referred to household antimicrobials as, "superfluous and risky." Subsequently, soap and detergent manufacturers in Europe agreed to a ban on any increase in use above 1998 levels. In the United Kingdom, four major grocery chains have banned triclosan from their products.^{2,7}

Cecil Fox PhD, retired National Institutes of Health (NIH) senior microbiologist and immunologist, expressed frustration saying, "I am troubled that governmental review of triclosan has failed to scrutinize the development of resistant microorganisms (and the byproduct, antibiotic resistant microbial populations) and transport and accumulation of triclosan residues through skin and mucosal

absorption. FDA's failure is a national scandal."⁹

In 2005, a federal advisory panel to the FDA voted 11 to one to declare that antibacterial soaps and washes offer no greater protection than regular soap and water. The panel of independent experts acknowledged the chemical germ-killers could actually contribute to the growth of antibiotic-resistant bacteria. Dr. Alastair Wood, chairman of the Nonprescription Drugs Advisory Committee, said, "There is no evidence they are a good value."¹⁰

A coalition of health and environmental groups led by Beyond Pesticides petitioned the FDA on October 25, 2005 to pull the controversial chemical from the market. Jay Feldman, executive director of Beyond Pesticides, expressed the group's concern by stating, "The failure to regulate triclosan as the law requires puts millions of people and the environment at unnecessary risk to toxic effects and elevated risk to other bacterial diseases."¹⁰

Dr. Stuart Levy, president of the Alliance for Prudent Use of Antibiotics, advocates restricting antibacterial products from consumer goods and leaving them where they are most needed, in hospitals and in the homes of very sick people. It will take years before our regulatory agencies move to ban triclosan, and even more years will pass during which those same agencies will allow manufacturers to sell off existing products. As consumers, we don't have to wait that long. We can choose to ban these products from our homes with our very next purchases. Dr. Levy reminds us that, "Bacteria are not going to be destroyed. They've seen dinosaurs come and go. They will be happy to see us come and go. Any attempt to sterilize our home is fraught with failure."¹⁰

Correspondence

Rose Marie Williams
156 Sparkling Ridge Road
New Paltz, New York 12561 USA
845-255-0836 / Fax 845-255-5101

References

1. Triclosan. Available at: <http://en.wikipedia.org/wiki/Triclosan>. Accessed February 18, 2006.
2. Glazer, A. The ubiquitous triclosan, a common antibacterial agent exposed. *Pesticides and You*. Vol. 24, No. 3, 2004. Available at: www.beyondpesticides.org/pesticides/factsheets.
3. McGehee, A, PhD. Triclosan. Available at: http://www.lindachae.com/Triclosan_article.htm. Accessed February 18, 2006.
4. Lark, S, MD. Triclosan. *The Lark Letter* (877-437-5275). June 2004; 11(6).

5. Baldwin, D. Mold? Mildew? Odors? New towels fight back. *The New York Times*. August 11, 2005.
6. Fox, M. Health & Science Corresp., Reuters. Common disinfectant could breed superbugs. Available at: http://www.lindachae.com/common_disinfectant.htm. Accessed February 18, 2006.
7. Kepner, J. Triclosan hazards continued. *Pesticides and You*. Winter 2004/2005; 24(4).
8. Antibacterial dish liquids + chlorinated water = dangers in your dishwasher. *FL Breast Cancer Resource Network* (800-696-8349). Summer 2005.
9. Groups ask FDA to ban antibacterial products containing triclosan. Technical Report. November 2005; 20(11). *Beyond Pesticides*. Available at: www.beyondpesticides.org.
10. Soap claims don't wash, panel says. *Poughkeepsie Journal* (NY). October 21, 2005.