

## Six Classes

### 2. Chlorinated Antimicrobials: Triclosan and Triclocarban

#### What Are They and How Are They Used?

Antimicrobials prevent the growth of bacteria and other microscopic organisms. They are similar in principle to antibiotics but are used outside the body to decrease bacterial levels on surfaces or in products humans contact. Two chlorinated chemicals known as triclosan and triclocarban have similar chemical structures and are the most commonly used antimicrobials. Triclosan was originally used in hospitals. Triclosan and also triclocarban are now used in many consumer products such as detergent, soap, shampoo, deodorant, body lotion, cosmetics, toothpaste, mouthwash and clothing. Triclosan is also embedded into plastic that is used to make furniture, fitness mats, toys, and cutting boards.<sup>1</sup>

#### Is There Human Exposure?

The Centers for Disease Control detected triclosan at varying concentrations in the urine of 75% of Americans tested.<sup>2,3</sup> Research suggests a correlation between urine and blood concentrations of triclosan and triclocarban and the use of personal care products.<sup>1,3</sup> Both triclosan and triclocarban are readily absorbed across the skin: in a recent study, elevated triclocarban concentrations were detected in blood immediately after bathing with soap containing triclocarban.<sup>4</sup> Children who use adult toothpaste containing triclosan may receive higher doses of the compound than adults because they tend to swallow much more toothpaste.

#### Why Are They A Concern?

Human health concerns stem from the evidence that triclosan is an endocrine disruptor for estrogenic, androgenic and thyroidal systems.<sup>5,6</sup> Both triclosan and triclocarban have the unusual property of increasing the effects of naturally-occurring estrogens rather than behaving as estrogens themselves.<sup>6,7</sup> A Norwegian study suggested that a child's exposure to triclosan is a risk factor for hypersensitivity to airborne allergens.<sup>8</sup> This finding is supported by a study in mice in which triclosan made their allergic reaction to a lung allergen more severe.<sup>9</sup> Triclosan and triclocarban are not carcinogenic or highly toxic in traditional toxicology studies.<sup>10</sup>

Triclosan and triclocarban are released from sewage treatment plants and are prevalent in the environment.<sup>11</sup> This leads to concerns for their impact on aquatic ecosystems.

#### Position of Regulatory Agencies, Manufacturers and Hospitals

The US Food and Drug Administration (FDA) reviewed triclosan in August 2012 and stated that while it is not known to be hazardous to human health, there are concerns about endocrine disruption and the possibility of bacterial resistance.<sup>12</sup> FDA's review of triclosan is ongoing.

Triclosan was first registered as a pesticide by the US EPA in 1969. Similarly, the EPA has determined that more research is needed on the safety of triclosan, specifically with regard to endocrine-disrupting effects.<sup>13</sup> The European Union has determined that the use of triclosan in individual cosmetic and personal care products is not a risk but that the cumulative effect from multiple products can be a health concern.<sup>14</sup> The European Union enacted a ban on triclosan in materials intended for food contact but that ban did not pass a legal challenge in 2011. A review by the Canadian government did not consider triclosan in consumer products to be a health concern.<sup>15</sup> On the other hand, certain manufacturers of personal care products have announced a phase-out of triclosan from their products.<sup>16,17</sup> Kaiser Permanente announced in 2010 that its chain of 37 hospitals has gone triclosan-free because of health and environmental concerns.

## Do We Need Them?

Triclosan may have an important role in hospital settings where dangerous bacteria are common and there are many vulnerable patients. However, the widespread use of triclosan and triclocarban in soaps and other consumer products does not have a proven benefit. For example there is no evidence that triclosan provides any benefit over washing hands with normal soap and water.<sup>12</sup> Concerns in the medical community have been raised about triclosan promoting the growth of resistant bacteria.<sup>18</sup> The Mayo clinic has stated “There's no evidence that cutting boards containing triclosan prevent the spread of food-borne infections. These boards also may give a false sense of security and cause you to relax other efforts to keep the board clean.”<sup>19</sup> The one consumer use for which a benefit has been identified is in adult toothpaste where triclosan can slow the growth of plaque-forming bacteria and thus help prevent gum disease. However, adults should check with their dentists regarding their personal need for antibacterial toothpaste to avoid unnecessary triclosan exposure. Young children should not use adult toothpaste, both because of fluoride and triclosan. In products in which antimicrobials provide a benefit, more benign, non-halogenated alternatives to triclosan and triclocarban should be investigated.

## Footnotes

- <sup>1</sup>Den Hond et al. 2013. Biomarkers of human exposure to personal care products: Results from the Flemish Environment and Health Study (FLEHS 2007-2011). *Sci Total Environ.* 463-464:102-10.
- <sup>2</sup>Calafat et al. 2008. Urinary concentrations of triclosan in the U.S. population: 2003-2004. *Environ Health Perspect.* 116: 303-7.
- <sup>3</sup>Wolff M et al. 2007. Pilot Study of Urinary Biomarkers of Phytoestrogens, Phthalates, and Phenols in Girls. *Environmental Health Perspectives* 115: 116-121.
- <sup>4</sup>Schebb et al. 2011. Investigation of human exposure to triclocarban after showering, and preliminary evaluation of its biological effects. *Environ Sci. Technol.* 45: 3109-3115.
- <sup>5</sup>Paul et al. 2012. Developmental triclosan exposure decreases maternal, fetal, and early neonatal thyroxine: a dynamic and kinetic evaluation of a putative mode-of-action. *Toxicology.* 300: 31-45.
- <sup>6</sup>Louis et al. 2013. The effect of triclosan on the uterotrophic response to extended doses of ethinyl estradiol in the weanling rat. *Reprod Toxicol.* 36: 71-77.
- <sup>7</sup>Tarnow et al. 2013. Effects of triclocarban on the transcription of estrogen, androgen and aryl hydrocarbon receptor responsive genes in human breast cancer cells. *Toxicol In Vitro* 27: 1467-75.
- <sup>8</sup>Bertelsen et al. 2013. Triclosan exposure and allergic sensitization in Norwegian children. *Allergy* 68: 84-91.
- <sup>9</sup>Anderson et al. 2013. Exposure to triclosan augments the allergic response to ovalbumin in a mouse model of asthma. *Toxicol Sci.* 132: 96-106.
- <sup>10</sup>Rodricks et al. 2010. Triclosan: a critical review of the experimental data and development of margins of safety for consumer products. *Crit Rev Toxicol.* 40: 422-484.
- <sup>11</sup>Halden et al. 2005. Co-occurrence of triclocarban and triclosan in U.S. water resources. *Environ. Sci. Technol.* 39:1420-1426.
- <sup>12</sup>FDA Consumer Update: Triclosan: What Consumers Should Know. August 29, 2012. Available at: <http://www.fda.gov/forconsumers/consumerupdates/ucm205999.htm> .
- <sup>13</sup>USEPA Webpage: Triclosan Facts, updated March 2010. Available at [http://www.epa.gov/oppsrrd1/REDS/factsheets/triclosan\\_fs.htm](http://www.epa.gov/oppsrrd1/REDS/factsheets/triclosan_fs.htm).
- <sup>14</sup>European Union Scientific Committee on Consumer Safety March 22, 2011. Opinion on Triclosan.
- <sup>15</sup>Health Canada Webpage: Safety of Triclosan, updated April 2013. Available at <http://healthycanadians.gc.ca/environment-environnement/home-maison/triclosan-eng.php> .

<sup>16</sup>CBS News August 15, 2012. Johnson & Johnson to phase out potentially harmful chemicals by 2015. Available at ([http://www.cbsnews.com/8301-504763\\_162-57493890-10391704/johnson-johnson-to-phase-out-potentially-harmful-chemicals-by-2015/](http://www.cbsnews.com/8301-504763_162-57493890-10391704/johnson-johnson-to-phase-out-potentially-harmful-chemicals-by-2015/)).

<sup>17</sup>The Daily Green, Sept 9, 2013: P&G to Remove Phthalates and Triclosan from Products.

<sup>18</sup>American Medical Association 2000 Annual Meeting: Summaries and Recommendations of Council on Scientific Affairs Reports - page 4; Use of Antimicrobials in Consumer Products (CSA Rep. 2, A-00). Available at: (<http://www.ama-assn.org/resources/doc/csaph/csaa-00.pdf>).

<sup>19</sup>Triclosan White Paper, The Alliance for the Prudent Use of Antibiotics, Tufts University. Available at [http://www.tufts.edu/med/apua/consumers/personal\\_home\\_21\\_4240495089.pdf](http://www.tufts.edu/med/apua/consumers/personal_home_21_4240495089.pdf).