



TRICLOSAN

INTRODUCTION

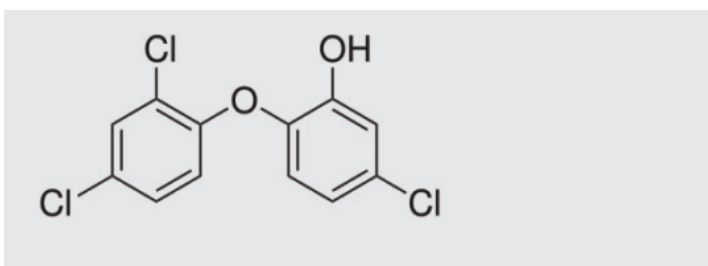
Triclosan [5-chloro-2-(2,4-dichlorophenoxy)phenol; S] is a chlorinated aromatic chemical having antimicrobial and antifungal properties.¹ However the antimicrobial properties of Triclosan vary, at low doses Triclosan is bacteriostatic in nature and at higher doses it becomes bactericidal². Due to these antibiodes and antibacterial properties Triclosan has been used as a preservative and antibacterial agent in personal care products, soaps, veterinary, industrial and household products. Triclosan has also been categorized as a halogenated aromatic hydrocarbon having phenolic, diphenyl ether and polychlorinated biphenyl (PCB) substructures³ so is related to many toxic compounds such as PCBs, polybrominated diphenyl ethers, bisphenol A and dioxins⁴.

HEALTH IMPACTS OF TRICLOSAN

The research studies have increasingly linked Triclosan to numerous adverse health effects on human health and animals. The most likely routes of exposure to Triclosan are ingestion, inhalation and absorption through the skin⁵. Further as Triclosan is bioaccumulative in nature, it can enter the food chain through fish or other aquatic organisms.

Triclosan has been shown to bind to both human estrogen and androgen receptors in vitro, raising concerns about its impact on the developmental and reproductive effects and also potential cancer risks. Human autopsy analysis reveals that Triclosan bioaccumulates in liver and adipose (fat) tissue, but not in brain tissue. The animal studies have also found that it can decrease the circulating concentration of thyroid hormone Thyroxine (T4) in rats. Children are most susceptible to the impact of Triclosan.⁶

FIGURE 1 CHEMICAL STRUCTURE OF TRICLOSAN



FACTS ABOUT TRICLOSAN

- Developed and registered as a pesticide in 1969
- First introduced in the 1970s for use in personal care products as an antimicrobial and preservative
- Designated as an "Endocrine Disrupting Chemical" (EDC)
- Bioaccumulates in liver and adipose tissues
- Photodegrade into dioxins and other chlorinated priority pollutants
- It has carcinogenic, mutagenic and teratogenic effects
- Children are the most susceptible to the impact of Triclosan

USES OF TRICLOSAN

- antiseptic soaps
- cosmetics
- deodorant
- detergents
- toothpastes
- mouthwash
- hair products
- plastics
- medical devices
- textiles & fabric
- kitchenware (as film)
- toys
- implantable medical devices
- selective agent in molecular cloning

**Not Effective
and Not Safe:
Govt. Must
Regulate
Dangerous
Antimicrobials
in Everyday
Products**

HEALTH IMPACTS

- Skin irritation
- Hormone disruption
- Interference with muscle function
- Contribution to antibacterial resistance
- Detrimental effects on the central nervous system
- May be linked to allergies and asthma.

Triclosan has been detected in human blood, plasma and milk^{7,8} in Sweden as well as Australia⁹ and also in human urine in USA¹⁰. A report on exposure of Triclosan during pregnancy has revealed that it affects the foetus and was detected in 100% of maternal urine and 51% of cord blood samples after conjugate hydrolysis¹¹. In a study carried out by Center for Disease Control and Prevention (NHANES study), measurable levels of Triclosan was found in 87 percent of urine samples examined in pregnant women.¹² There is no data available in Indian context.

Triclosan can affect aquatic wildlife and the hormonal systems of mice. It may impact male and female hormones like testosterone and estrogen, and may also affect thyroid systems, which regulate weight and metabolism.¹³

ENVIRONMENTAL IMPACT OF TRICLOSAN

Triclosan has been used in range of products and is widely being used in many consumer products. And the chemical is being disposed of in drains

from the products and is known as an ubiquitous water contaminant.

Triclosan is one of the chemical which is frequently being detected in the stream, effluents and biosolids of wastewater treatment plants(WWTPs) also in lakes, rivers and sea water in various countries^{14,15,16,17}. Triclosan bioaccumulates in aquatic plants and animals and poses multiple ecotoxicity risk. The chemical also enters into the food chain from the contaminated water and agricultural runoff. Triclosan is found in freshwater samples, especially in lakes and downstream from wastewater treatment plants, in concentrations known to be harmful to wildlife^{18,19}.

Triclosan is readily degraded in the environment via photodegradation or react with sunlight, with a half-life of a week in aerobic and to a month in anaerobic conditions in soil²⁰, forming other compounds which include chlorophenols and dioxins²¹. An atmospheric half-life of 8 hours has also been estimated based on the reaction of triclosan with photochemically produced hydroxyl radicals²².

Triclosan may encourage the development of antibiotic resistance in pathogenic bacteria. The ubiquitous use of triclosan has conferred to antibiotic resistance of microorganisms and cross resistance^{23,24}.

REGULATIONS

There are number of research studies those are linked with Triclosan and its endocrine disrupting

HOW TRICLOSAN ACTS

Triclosan blocks the active site of the enoyl-acyl carrier protein reductase enzyme (ENR), which is an essential enzyme in fatty acid synthesis in bacteria. By blocking the active site, triclosan inhibits the enzyme, and therefore prevents the bacteria from synthesizing fatty acid, which is needed for building cell membranes and for reproducing.

Triclosan is lipophilic in nature, so the chemical generally binds and bioaccumulates in the fatty tissues. It has the tendency to interfere with hormone function, so has been categorized as an endocrine disrupting chemical or endocrine disruptor.

The endocrine disruptor has been defined as an “*exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in intact organisms or its progeny or populations*”. There are some chemicals which are being identified as the potential endocrine disruptor and have been kept in a group known as EDCs. The issues of EDCs have been considered as a serious health issue globally and have been accepted as an emerging issue in the Strategic Approach to International Chemical Management (SAICM).

MANUFACTURERS INITIATIVES

Major manufacturers have taken voluntary actions to phase out Triclosan from their products. Johnson & Johnson has voluntarily removed Triclosan from baby personal care products. Similarly Procter and Gamble and Colgate Palmolive have also announced to remove Triclosan from their personal care products.

properties. The countries have initiated regulations to restrict the use of Triclosan in various products.

The EU has put stringent regulations for Triclosan in cosmetics and also banned in some products that will be effective from 1 January 2017. As per the EU cosmetic directives, the limit for Triclosan has been restricted to 0.2% in mouthwashes, and 0.3% in other cosmetic products such as toothpastes, hand soaps and face powders.

TRICLOSAN PHASE OUT IN EU

The European Chemical Agency responsible for the chemical regulations in EU has proposed to phase out Triclosan from various products effective from 2017

The US EPA regulates the antimicrobial uses of Triclosan when used as a bacteriostat, fungistat, mildewstat, and deodorizer. The FDA-regulated uses include hand soaps, toothpaste, deodorants, laundry detergent, fabric softeners, facial tissues, antiseptics for wound care, and medical devices.

Minnesota is the first state of USA that has banned the use of Triclosan from retail consumer hygiene products that will be effective from 1 January 2017.

In Australia maximum Triclosan permissible limit in cosmetic is 0.3%. In Japan, Triclosan is included in the Standards for Cosmetics (as established by the Pharmaceutical Affairs Law, 1960), which sets a maximum allowable concentration of 0.1% in cosmetic products (Ministry of Health and Welfare Notification No. 331, 2000).

In India as per the Bureau of Indian Standards for cosmetics raw materials & adjuncts, Triclosan has been allowed to use Maximum Authorized Concentration (MAC) as the preservatives 0.3%.

ALTERNATIVES TO TRICLOSAN

According to the Centers for Disease Control and Prevention (CDC), vigorous hand washing in warm water with plain soap for at least 10 seconds is sufficient to fight germs in most cases, even for healthcare workers. For extra assurance, use of an alcohol- or peroxide-based hand sanitizer product is a good option. Some common natural alternatives to Triclosan are Neem and Clove.

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