Environmental and Human Health Impacts of Triclosan

Wastewater and the Environment:

Triclosan is marketed as an antimicrobial agent that adds value to various hygiene and other consumer products [Perencevich, 2001]. Unfortunately, its increased prevalence in a variety of products means that increasing amounts are ending up down the drains, into the wastewater treatment plants [Shelver, 2007; Tatarazako, 2004; Dann, 2011] and ultimately into the environment. While some triclosan gets removed in the water treatment process significant amounts still make it out into the environment when biosolids from the wastewater treatment process are used as crop fertilizers. [Sabaliunas, 2003; Bock, 2010]. Once in the environment triclosan is very good at killing certain types of algae [Tatarazako, 2004]. Since environmental algae are primary producers, decreases in their abundance lead to subsequent decreases in the zooplankton that feed on the algae; in so doing propagate the effects of triclosan further up the food web. At very high concentrations, this could have a dramatic effect on the trophic balance of the ecosystems we all depend on. At more dilute concentrations, we might expect to see long-term rebalancing of trophic levels and in ways that are difficult to predict and whose significance to human health are unknown.

Human and Animal Effects:

Triclosan has also been shown to bioaccumulate in animals and have serious effects on their hormones during development. [Fair, 2009; Raut, 2009]. It has been shown to get absorbed into the human body through the salivary glands and exits through the urinary tract [Calafat, 2008]. In addition, triclosan has been shown to be an endocrine disruptor[Crofton, 2007; Zorrilla, 2009; Paul, 2010; Raut, 2009; Stoker, 2010]. Some animal studies have shown that triclosan alters important hormone levels, which could result in neurotoxicity, decreased thyroid function and the growth of breast cancer cells[Gee, 2008; James, 2010; Fair, 2009]. Finally, triclosan has been found in 97% of american mothers' breast milk and fetal cord blood; while its health effects are not completely known this observation that together with its known influence on important cell signalling pathways raises further questions about why it is used so prevalently[Allymyr, 2006; Adolfsson-Erici, 2002; Peters, 2005].

Antimicrobial resistance:

The use of antimicrobial compounds has accelerated rapidly across a wide variety of sectors (from healthcare to agriculture to consumer goods) since the discovery of penicillin in 1928 [Ligon, 2004]. However, the overuse of antimicrobials has been starting to show its negative effects. For example, bacteria resistant to antibiotics is directly responsible for 15 times as many deaths in Europe every year than AIDS[González-Zorn, 2012]. In the case of triclosan, certain resistant strains of Staphylococcus aureus have already been discovered[Suller, 2000; Fan, 2002]. This is quite alarming since resistance seems to be due to a single point mutation. Given the seemingly low evolutionary barrier for resistance to triclosan, it's beneficial use in hospital settings, and its ever growing environmental footprint, it seems that concern over its seemingly unregulated use is warranted[Shelver, 2007; Tatarazako, 2004; Dann, 2011]. While the concentrations used in consumer products is too high to select for resistance in the products themselves, the residues from the cosmetics and other products left on countertops may have the right concentrations needed for resistance selection[Levy, 2002; Yazdankhah, 2006].

While antimicrobials have always been present in the natural environment – there are ways that plants and fungi naturally defend themselves from invading bacterium[González-Zorn, 2012] - human exploitation of these natural resources and overuse are causing a decrease in their efficacy. Through public awareness, control and proper human practice, the use of antimicrobials like triclosan can be decreased help minimize their impact on the environment and to help maintain their efficacy in the places their use is warranted.

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