Triclosan and Antibiotics resistance

Source document:
SCCS (2010)

Summary & Details:
GreenFacts (2011)

Context - Triclosan is added to many consumer goods such as cosmetics and detergents to kill microorganisms or inhibit their growth. It serves as disinfectant, preservative or antiseptic and is widely used in health care and animal husbandry.

There is concern that this widespread use of triclosan may lead to the emergence or proliferation of harmful bacteria that are resistant to both biocides and antibiotics.

In the light of current scientific evidence, can triclosan lead to antibiotic resistant bacteria?

The answers to these questions are a faithful summary of the scientific opinion produced in 2010 by Scientific Committee on Consumer Safety (SCCS):
"Opinion on triclosan (antimicrobial resistance)"

The full publication is available at: http://copublications.greenfacts.org/en/triclosan/
and at: http://ec.europa.eu/health/opinions/en/triclosan/

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- Each question is answered in Level 1 with a short summary.
- These answers are developed in more detail in Level 2.
- Level 3 consists of the Source document, the internationally recognised scientific opinion which is faithfully summarised in Level 2 and further in Level 1.

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1. What is the biocide triclosan?

1.1 Microorganisms can be killed or inhibited by different antimicrobial products, namely antibiotics that act against bacterial infections in humans or animals and biocides such as disinfectants and preservatives.

1.2 Triclosan is a biocide that has been particularly widely used for more than 40 years. At high concentrations, triclosan is very effective at killing a broad range of microorganisms including many bacteria. At low concentrations, it does not kill them but it stops their spread.

2. What are the main uses of triclosan?

Triclosan is widely used, notably in personal care products such as cosmetics, but also in textiles and in plastics.


Triclosan is used in detergents and soaps
Credit: Sanja Gjenero

2.1 In **cosmetics** triclosan serves as a preservative. It is also included in soaps, in deodorants and in toothpastes – to control plaque and improve the health of the gums.

2.2 In **health facilities**, triclosan helps prevent and control infections. It is contained in hand washes, antiseptics and disinfectants and is also integrated into surfaces of medical devices such as surgical suture material.

2.3 Triclosan is added to many **household products** such as soaps and detergents. It is also included into some articles such as children's toys, carpets and textiles to prevent microorganisms from growing on them.

2.4 In the EU, triclosan may neither be used in food, nor in food contact material, nor in animal feed. But it may be used in biocidal products for **veterinary hygiene**.

3. What happens to triclosan in the environment?

3.1 Because of it widespread use triclosan finds its way into wastewater. In treatment plants most triclosan is removed and the remainder is discharged into surface waters. The removed triclosan is partly broken down, but about half of it ends up in treatment sludge and may enter the environment if the sludge is used to fertilize agricultural soils.

3.2 Although, triclosan is chemically very stable, it can be broken down by light, ozone, chlorine, and some microorganisms.

3.3 If present in soil, triclosan does not seem to affect bacterial activity, but it may disrupt the nitrogen cycle.

4. When are bacteria said to be "resistant"?

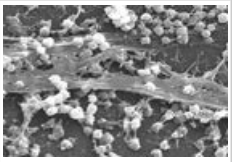
Bacteria are said to be "resistant" to antimicrobial product – antibiotic or biocide – if they survive concentrations that would kill most bacteria of the same species.

Some bacteria are naturally unaffected by antimicrobial products, and others may develop resistance to certain biocides over time. Bacteria can become increasingly tolerant to antimicrobial substances so that they can withstand progressively higher concentrations.

In some cases, resistance against biocides can lead to resistance to antibiotics.

When different strains of bacteria are exposed to an antimicrobial, those that have resistance genes survive while the others are killed. Over time, this can lead to the selective survival of resistant strains, and to an increase of resistance.

5. Can bacteria become resistant to Triclosan?


Bacteria that grow as a biofilm are able to survive hostile conditions.
Credit: Janice Carr

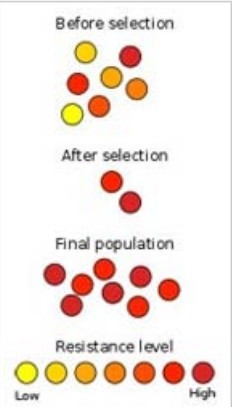
5.1 Some bacteria are naturally unaffected by triclosan. Others have developed mechanisms of defence against it when exposed to low concentrations of triclosan in the laboratory. When such mechanisms involve changes at genetic level they could be passed to the next generations or even between different bacteria.

5.2 Antibiotics and triclosan sometimes work in similar ways. Some laboratory studies have shown that when exposed to triclosan, bacteria can develop genetic resistance that can make them resistant to other antimicrobials or, worse, to antibiotics. Such cross-resistance if occurring in real situations could have severe consequences for public health.

5.3 There is very little research on bacterial exposure to triclosan in the environment and its impact but so far, there is no evidence that the widespread use of triclosan has caused resistance.

5.4 Standard protocols for the evaluation of bacterial resistance to biocides need to be developed. It would also be useful to identify genetic characteristics that enable bacteria to develop resistance mechanisms.

6. Conclusions of the SCCS



Resistant bacteria can survive biocide concentrations that would kill others.

6.1 There are several reasons why the use and release of triclosan into the environment could pose a risk:

- Bacteria exposed to low concentrations of triclosan could activate resistance genes that they could in principle transfer to other bacteria.
- Triclosan, like any other biocide, contributes to the selection of more resistant bacteria, because it eliminates competition.
- Resistance to triclosan could lead to resistance to other biocides or antibiotics.

Triclosan is the most studied biocide with respect to antimicrobial resistance, especially its action on bacteria and mechanisms of microbial resistance. However, laboratory conditions may differ from real life conditions and information is still insufficient about the amount and impact of triclosan on bacteria in the environment.

6.2 The Scientific Committee on Consumer Safety (SCCS) concludes that to date, there is no evidence that using triclosan leads to an increase in antibiotic resistance. However it is

too early to say that triclosan exposure never leads to microbial resistance, as there is not yet enough information to make a full risk analysis.

To preserve the role of triclosan in infection control and hygiene, SCCS can only recommend its prudent use, for instance limited to applications where a health benefit can be demonstrated.

Partner for this publication