

Investigating the environmental impact of nanosilver

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Credit: AI-generated image ([disclaimer](#))

When it comes to materials used in the fight against bacteria, silver may not be the first substance which comes to mind. However, the precious metal has been used in the medical industry as a biocide - a substance which can deter, render harmless, or exert a controlling effect on any harmful organism - since the 1930s.

These days, antimicrobial [silver nanoparticles](#) are used in a variety of ways, such as for preventing unpleasant odours caused by bacteria in sport shirts or socks. While silver's [antibacterial properties](#) have been appreciated, there has always been a concern over the effect [nanosilver](#) may have when it is released into wastewater during washing. Research has shown that nanosilver presents a minute risk to the environment as it is transformed into a nearly insoluble substance called silver sulphide in wastewater treatments.

In search of a definitive conclusion on the potential risks, the EU funded PROSUITE project has been set up to analyse the [environmental impact](#) of nanosilver released from sports T-shirts during their entire life cycle, from raw material extraction to end-of-life disposal.

'Nanosilver can be applied in lower quantities than other [antimicrobials](#) and hence has advantages for resource use and environmental loads,' says Tobias Walser, a researcher at the Institute for environmental engineering at the Swiss Federal Institute of Technology in Zürich. However, 'the environmental and human risk of nanosilver has yet to be fully understood', he adds.

The PROSUITE study 'is very relevant' because it 'gives a fingerprint' about the impact of such T-shirts, says Professor Anders Baun from the Department of environmental engineering at the Technical University of Denmark. However, Baun says, in general, 'it is a bad idea to distribute silver in the environment'. He points to a study that found evidence for nanosilver accumulating in the food chain based on a study of [plants and animals](#) in an experimental wetland environment. Moreover, he says, it is unknown how the coating of nanosilver influences its environmental behaviour.

PROSUITE's research, the first of its kind on a nanomaterial, found that a nanosilver treated T-shirt's environmental impact during use would be

reduced if it was washed less often than conventional ones, due to its antimicrobial properties. This would even compensate for a slightly higher environmental footprint during production. Walser explains: 'In comparison to all toxic releases during the life cycle of a T-shirt, the toxic releases from nanosilver from washing appear to be of minor relevance.'

'The [PROSUITE] study is an important step into the right direction,' comments Bernd Nowack, an expert in environmental risk assessment at Empa, the Swiss Federal Laboratories for Materials Science and Technology. Yet, to be able to fully assess the environmental benefits of nanosilver textiles, more should be known about issues such as the industrial production of nanosilver or whether the textiles are actually washed less often. Nowack regards nanosilver as an effective biocide, with few drawbacks. 'There is no strong evidence for the toxicity of nanosilver,' he adds.

Walser, currently a visiting scientist at the US Environmental Protection Agency, is now collecting data and conducting modelling studies on nanoparticle emissions from production sites to improve the life-cycle assessment of nanotextiles. While there is no threat to people using such textiles, this is possibly not the case for workers in the nanotechnology industry who may inhale the particles, Walser says. 'The nanoparticles can penetrate deeply into the lung' and inhalation therefore remains 'the critical pathway'.

More information: For more information, please visit:
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