The release of silver nanoparticles from commercial toothbrushes - DTU Orbit (15/12/2018)

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The use of silver nanoparticles (NPs) in commercial products has become increasingly common in the past decade, mostly due to their antimicrobial properties. Using Ag NP-containing articles may lead to particle release, which raises concern of human and environmental safety. The published literature addressing particle release is scarce, especially when it comes to quantifying exposure to NPs specifically. In this study, we have experimentally investigated the release of total Ag and Ag NP from commercially available toothbrushes i.e. biodegradable toothbrushes for adults and toothbrushes for children. Toothbrushes were immersed and abraded in tap water for 24 h corresponding to more than the whole intended usage time of a toothbrush. The total amount of released Ag was quantified by inductively coupled plasma-mass spectrometry (ICP-MS) analysis, and the Ag NPs were characterized by single particle ICP-MS and transmission electron microscopy (TEM). The median size of the released Ag NPs ranged from 42 to 47 nm, and the maximum total Ag release was 10.2 ng per toothbrush. The adult toothbrushes were generally releasing more total Ag and NPs than children toothbrushes. In conclusion, our results indicate that the use of Ag NP-impregnated toothbrushes can cause consumer as well as environmental exposure to Ag NPs.

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