# Application of silver-based biocides in face masks intended for general use requires regulatory control

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Silver-based biocides are applied in face masks because of their antimicrobial properties. The added value of biocidal silver treatment of face masks to control SARS-CoV-2 infection needs to be balanced against possible toxicity due to inhalation exposure. Direct measurement of silver (particle) release to estimate exposure is problematic. Therefore, this study optimized methodologies to characterize silver-based biocides directly in the face masks, by measuring their total silver content using ICP-MS and ICP-OES based methods, and by visualizing the type(s) and localization of silver-based biocides using electron microscopy based methods. Thirteen of 20 selected masks intended for general use contained detectable amounts of silver ranging from 3 *µ*g to 235 mg. Four of these masks contained silver nanoparticles, of which one mask was silver coated. Comparison of the silver content with limit values derived from existing inhalation exposure limits for both silver ions and silver nanoparticles allowed to differentiate safe face masks from face masks that require a more extensive safety assessment. These findings urge for in depth characterization of the applications of silver-based biocides and for the implementation of regulatory standards, quality control and product development based on the safe-by-design principle for nanotechnology applications in face masks in general.

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