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# Microplastic release from baby feeding bottles according to different application conditions

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## Abstract

Recent studies on plastic particle release from baby feeding bottles have shown conflicting results. In order to gain further insights here, we conducted this comparative study in cooperation with Greenpeace e.V. and the German Midwifery Association.

We included eleven bottles from different brands and models with different bottle materials (plastic, glass, and stainless steel). In order to mimic realistic conditions, the bottles were exposed to different conditions of use. This included the sterilization of the bottles, the shaking of bottles with filtered MilliQ water at different temperatures (20, 45 and 70 °C), a long-time exposure to continuous shaking over 28 d and mechanical stress of repeated screwing and unscrewing of the bottle cap (20, 40 and 60 times). All tests have been carried out in triplicates, all experimental scenarios included the analysis of blank samples.

The resulting sample suspensions were transferred onto glass fibre filters and further analysed applying Nile Red staining, fluorescence microscopy (AxioLab A.1, Zeiss, TRITC HC Filterset (AHF), 2.5x) for counting and measuring of microplastic particles > 4 µm. Polymer composition was recorded on a subset of particles via µRaman spectroscopy (DXR2xi Raman Imaging Microscope, Thermo Fisher Scientific).

The study shows that the release of microplastic particles is above all a factor of the brand and to a lesser extent the bottle material. With regard to the scenarios investigated, the factor of temperature has the greatest influence on particle release. The duration of use (simulated in the shaking test) does not show any temporal trends, which speaks for a continuous, uniform release. The test for release through mechanical stress (simulated in the screw test) indicates that a relevant proportion of microplastic particles are introduced into the bottle by screwing and unscrewing the cap, though, this value does not increase through further repetitions.

**Keywords:** Human consumption, Infants, Particle release, Nile Red, Raman

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