COVID-19 disposable face masks: source of microplastics and chemical additives in the environment

Anna Bogush*[1] and Ivan Kourtchev[2]

[1]Research Centre for Agroecology, Water and Resilience (CAWR), Coventry University – Wolston Ln, Ryton-on-Dunsmore, Coventry CV8 3LG, United Kingdom

[2]Research Centre for Agroecology, Water and Resilience, Coventry University – Wolston Ln, Ryton-on-Dunsmore, Coventry CV8 3LG, United Kingdom

Abstract

The production and consumption of disposable face masks, also called as single use face masks, increased dramatically during COVID-19 pandemic and that created new challenges for local authorities due to the volume of Personal Protective Equipment (PPE) waste being created (Prata et al., 2020; Selvaranjan et al., 2021; Benson et al., 2021). Prata et al. (2020) estimated that about 129 billion face masks were used monthly worldwide during the COVID-19 pandemic. Recently, disposable face masks were found in a high amount in the terrestrial and aquatic environment (Fadare and Okoffo, 2020; Aragaw, 2020; Roberts et al., 2020). Therefore, disposable face masks can be potentially an additional source of microplastics in the environment, particularly, during the pandemics like COVID-19. The main goal of this research is to investigate leachability of microplastics and chemical additives from disposable face masks. The main types of disposable face masks were used for the water-leachability experiments: 1) surgical/medical masks (blue surgical masks - Type I, Type II, and Type IIR); 2) respirator masks (FFP masks - N95, FFP2, and FFP3). A Fourier-Transform Infrared Spectroscopy (FTIR) microscope (Thermo Scientific Nicolet iN10MX) was used for microplastics analysis. A Q Exactive™ Focus Hybrid Quadrupole-Orbitrap™ Mass Spectrometer equipped with an Electrospray-Ionisation (ESI) source (Thermo Fisher, Bremen, Germany) was used to analyse analytes presented in water-leachates from face masks (untargeted and then targeted approach). All investigated disposable face masks released microplastics, mainly polypropylene, in water (e.g. microfibres with length ranged from 100 to 2000 μm; smaller microplastic particles with size $<$ 100 μm and with different morphology). Bisphenol B was identified in MMII and MMIIR water extracts at concentration 0.25$\pm$0.02 ug/L and 0.42$\pm$0.02 ug/L, respectively. Bisphenol B (BPB), a substitute of bisphenol A (BPA), is widely used in the polycarbonate plastic and resins production.

Keywords: disposable face mask, microplastics, COVID, 19, chemical additives

*Speaker