Face Mask Protection Against Particulate Matter

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Every year air pollution causes many chronic diseases. Particulate matter (PM) is a mixture of various chemical compounds and there is strong evidence of its adverse health effects, however, much remains unknown. In times of the COVID-19 pandemic people often wear face masks. My aim was to examine how efficient surgical masks (Type II) and cloth masks (100% cotton) were when dealing with different particles. Two instruments (SMPS for counting nanoparticles and PM sampler) were simultaneously used to sample ambient air on a roof in an urban environment in Ljubljana. Each of the masks was put over the inlet of both instruments for a certain time period. The measurements of ambient air were compared to those performed with attached masks, and filtration efficiencies were calculated. Water extracts were prepared out of PM collected with the sampler, and concentrations of selected anions (anion chromatography) and organic carbon (with measuring absorbance of UV light) were determined. The filtration efficiencies of both masks were appraised from different perspectives. For the surgical mask the efficiency for PM10 (particles smaller than 10 μm) valued 94% and 84% for the cloth mask. Both masks were less efficient filtering smaller particles (for PM0.7 75% and 44%), organic carbon (84% and 36%) and ionic compounds (83% and 52%). Overall, the surgical mask performed better than the cloth mask, and its filtration efficiency was less influenced by particles' characteristics. The chemical composition of filtered PM did not show a significant impact on the efficiency, which was heavily dependent on the size of the particles.

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