Exploring the Use of Face Masks for Social Pathogen Detection and Personal Medical Diagnosis

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Though masks have now become an essential item the application of the now-widespread use of masks is greater than just in the context of protection from COVID-19. Throughout the day, mask-wearers eject potential pathogens, breath, saliva, and other biomarkers onto the masks by talking, coughing, and sneezing; this works to prevent the spreading of the pathogen that an infected person may carry. However, to make use of the otherwise waste, masks can be utilized for detecting the presence of health problems at both the individual and communal level. Saliva and exhaled breath, as they could contain bacterial or viral pathogens, circulating cell-free DNA (cfDNA), or extracellular vesicles (EVs), may act as effective indicators for ailments such as cancer. To test the prospect of personal diagnosis using masks, cell-cultured media of the A549 cell-line, which contains a cancer biomarker with a KRAS mutation, was spread onto the mask to simulate respiratory excretion. Gene sequencing conducted from the mask-extracted DNA, most likely of cfDNA or EV DNA, reflected the corresponding mutation accurately. Individual and mixed bacterial strains were sprayed onto a mask to be re-cultured after 72 hours of drying. The unknown bacteria from the mixture were identified through a series of identification tests and 16s rRNA sequencing. Successful regrowth of bacteria from the mask for strain identification and extraction of DNA showed that masks can retain viable bacteria and DNA, 72 hours after use. In summary, this study demonstrates the practicality of masks for pathogen identification and biomarker detection, suggesting applications for social and clinical applications in precision medicine.

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