Assessment of airborne bacteria and noroviruses in air emission from a new highly-advanced hospital wastewater treatment plant - DTU Orbit (10/01/2019)

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Exposure to bioaerosols can pose a health risk to workers at wastewater treatment plants (WWTPs) and to habitants of their surroundings. The main objective of this study was to examine the presence of harmful microorganisms in the air emission from a new type of hospital WWTP employing advanced wastewater treatment technologies. Air particle measurements and sampling of inhalable bacteria, endotoxin and noroviruses (NoVs) were performed indoor at the WWTP and outside at the WWTP ventilation air exhaust, downwind of the air exhaust, and upwind of the WWTP. No significant differences were seen in particle and endotoxin concentrations between locations. Bacterial concentrations were comparable or significantly lower in the exhaust air than inside the WWTP and in the upwind reference. Bacterial isolates were identified using matrix-assisted laser desorption-ionization time-of-flight mass spectrometry. In total, 35 different bacterial genera and 64 bacterial species were identified in the air samples. Significantly higher genus and species richness was found with an Andersen Cascade Impactor compared with filter-based sampling. No pathogenic bacteria were found in the exhaust air. Streptomyces was the only bacterium found in the air both inside the WWTP and at the air emission, but not in the upwind reference. NoV genomes were detected in the air inside the WWTP and at the air exhaust, albeit in low concentrations. As only traces of NoV genomes could be detected in the exhaust air, they are unlikely to pose a health risk to surroundings. Hence, we assess the risk of airborne exposure to pathogenic bacteria and NoVs from the WWTP air emission to surroundings to be negligible. However, as a slightly higher NoV concentration was detected inside the WWTP, we cannot exclude the possibility that exposure to airborne NoVs can pose a health risk to susceptible to workers inside the WWTP, although the risk may be low.

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