Environmental conditions and the prevalence of norovirus in hospital building drainage system wastewater and airflows

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Abstract
A potential cross-transmission route, first identified in the spread of the SARs virus in South East Asia, in which infection was spread by virus-laden aerosolised droplets entering habitable space via defective water traps is investigated. The main aim of this work was to detect norovirus in wastewater from the collection drain in a hospital Building Drainage System and attempt to trace it in the BDS vent airflow. The methodology employed polymerase chain reaction tests on waste water samples and indicated strong positives for the norovirus GII strain from the collection drain, corresponding to an outbreak in the building, confirming that the BDS is contaminated in such circumstances and poses a threat. Pathogens were not detected in the BDS vertical stack airflows; however, the methodology employed to collect samples from the airflow was considered ineffective requiring further research. An average temperature of 24.3°C was recorded, together with an average humidity of 96.6%. This research also confirmed that inside the building drainage stack, air flow movement occurs in both the 'up' and 'down' direction. Thus, aerosolised pathogens could travel from the contaminated horizontal collection drains upwards and enter wards via defective traps or little used showers, sinks, baths and sluices.

Practical application: The detection of norovirus from raw, unprocessed samples taken from the collection drain of a hospital complex highlights the need for caution in dealing with these large contaminated systems. The obvious area affected by these findings is in the awareness by building managers and facilities managers that this contamination exists and that all appropriate measures are taken to minimise infection spread due to normal o&m operations. While it was not possible to detect the virus in the airflow itself, it is considered significant that the identification of the direction and magnitude of these airflows confirms that building drainage stacks could act as conduits for the transmission of aerosolised pathogen-laden

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