

Pathogens including multi-drug resistant superbugs found on floors, ceilings and door handles of UK hospital toilets

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Pathogenic bacteria and fungi, including multi-drug resistant "superbugs" have been found on the floors, ceilings, door handles and other surfaces of hospital toilets in the UK, with patient toilets the worst

affected, the [ESCMID Global Congress](#) (formerly ECCMID) in Barcelona, Spain (27-30 April) will hear.

Women's bathrooms contained fewer microbes than men's, with female staff toilets particularly clean, while unisex and disabled (also unisex) toilets were the most contaminated. Multi-drug resistant bacteria were concentrated in patient toilets.

Professor Stephanie Dancer, a consultant microbiologist at NHS Lanarkshire, UK wondered whether toilets without lids spread microbes to other surfaces in the bathroom when flushed, as well as whether some toilets are more contaminated than others.

She says, "The move to convert traditional male and female facilities to unisex facilities in some hospitals raises concern that people might be exposed to higher risks of contamination. For example, hand hygiene surveys show that women are more likely to clean their hands after bathroom use than men, so we decided to investigate which microbes were present on different surfaces in toilets and how many of them there were.

"Our results appear to confirm what is generally thought in society: Women clean because their perception of dirt and disgust entices action whereas men either don't notice a dirty environment or don't care. It follows that women are more likely to leave a bathroom 'clean,' while men assume someone will clean up after them."

For the study, Professor Stephane Dancer and colleagues collected samples from toilets in three general hospitals in NHS Lanarkshire. Ten different surfaces in six types of toilets were swabbed more than 4 hours after cleaning on four different days one week apart in each hospital.

The surfaces were hand-touch surfaces (toilet flush; handrail; tap; door handle); floor surfaces; and high sites (door tops; shelves; air vents).

The six types of toilets were: male staff, female staff, male patient, female patient, disabled and unisex.

In total, 480 samples were collected from each hospital and the aerobic bioburden (amount of bacteria and fungi) were calculated for each type of [surface](#). Background flora and health care pathogens were isolated and identified and antimicrobial susceptibility testing was carried out.

The pathogens detected include Staphylococcus aureus (which causes wound and other infections), Escherichia coli, Klebsiella pneumoniae and Enterobacter cloacae (bloodstream and urinary tract infections); Acinetobacter baumannii, Citrobacter and Serratia (bloodstream infections in compromised patients); Enterococci (urinary tract and wound infections); Burkholderia cepacia (chest infections in patients with [cystic fibrosis](#)); Pseudomonas aeruginosa and Stenotrophomonas maltophilia (chest infections and ventilator-associated pneumonia); Staphylococcus saprophyticus (common cause of [urinary tract infections](#)) and Aspergillus fungi (chest infections in immunocompromised patients).

A substantial proportion of isolated pathogens were multidrug-resistant and these organisms were concentrated in both male and female patient toilets. No MRSA was detected.

Professor Dancer says, "Every type of toilet in all three hospitals receives the same cleaning (type and frequency) every day but given our findings, we think that patient toilets should be cleaned more often."

Overall, floors and high surfaces yielded higher levels of aerobic bacteria and fungi than hand-touch sites. It is likely that hand-touch sites

are cleaned more thoroughly than other surfaces, says Professor Dancer.

She adds, "In contrast with hand-touch sites, floors are a major repository of dirt. Anything in the air eventually ends up on the floor, along with whatever is brought in on people's footwear or shed from skin and clothes when they use the toilet."

To the researchers' surprise, Gram-negative pathogens such as E.coli, *Stenotrophomonas maltophilia* and *Klebsiella pneumoniae* were as likely to be found on air vents, ceilings and the tops of doors as on floors.

"We think that the only logical explanation for this is that toilet flushing aerosolises whatever is in the toilet bowl, whereupon tiny water particles carrying these organisms fly up to the ceiling and contaminate high sites," says Professor Dancer.

Female toilets had fewer microbes than male toilets (for example, samples from the handles inside the doors of male staff toilets had approximately eight times more microbes than those from the same handles in female staff toilets) and female staff toilets had the fewest microbes of all toilet types.

This might be due to more frequent handwashing among females, says Professor Dancer.

Gender-neutral toilets (unisex and disabled) had the highest microbial burden overall. This may reflect heavier overall use, as well as different attitudes to cleanliness between men and women, says Professor Dancer.

Professor Dancer concludes, "Airborne microorganisms and contaminated surfaces carry a potential risk for infection. Hospital toilets should have lids, which should be closed before you flush, and patient toilets should be cleaned more frequently than other toilets.

"Single sex and disabled toilets should be retained; with additional facilities labeled unisex and available for anyone. But based on this study's findings, I don't believe we should be abandoning single sex toilets in favor of unisex toilets, since these toilets had the highest microbial burden overall.

"None of the toilets sampled in the study had a window. I would be very interested to repeat the study in toilets with open windows providing an abundant supply of fresh air. There is no doubt everyone could do with more education on hand hygiene. The more we all understand about how to protect ourselves and others from germs, the better."

She also advises closing the toilet lid before flushing at home.

"Put the lid down before you flush and then wash your hands well and dry them with a clean towel," says Professor Dancer.

"If you can, open a window in the bathroom, before using the toilet, and that's not just to get rid of the smell."

"Similar findings are likely in other hospitals, depending on the type and frequency of cleaning and how often they are used," adds Professor Dancer.

More information: Abstract EW0104 at the ESCMID Global Congress (formerly ECCMID).

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