PROF. DR. MED. KLAUS-DIETER ZASTROW
DOCTOR FOR HYGIENE AND ENVIRONMENTAL MEDICINE
WEINHOLDWEG 5
14089 BERLIN,
GERMANY

23 February 2014

Comparative evaluation of conventional toilets with rimless toilets from TOTO. NC series CW762Y toilet with VC100 seat and CF series CW132Y toilet with VC130 seat (combination of rimless ceramic toilet bowl and Tornado Flush), special focus on spread of germs

Task

The task involves checking whether the TOTO toilet is especially suitable for areas in which hygiene is especially important, such as hospitals and health care facilities, due to its construction and features. The trial will see whether it is possible to clean the toilet with little effort, and if it prevents the spread of nosocomial pathogens.

Test objects

- NC series CW762Y toilet with VC100 seat
- CF CW132Y toilet with VC130 seat
- Conventional toilet with a rim

1. Level of cleanliness after flush

Using a cotton swab, the researchers applied the test substance (semolina) containing the germs listed below to seven different points inside the toilet bowl. Four of the most important nosocomial pathogens were used as test germs:

- Escherichia coli K12 NCTC 10538
- Enterococcus faecium ATCC 6057
- Pseudomonas aeruginosa ATCC 15442
- Acinetobacter baumanii

The researchers looked for any signs of residual soil after

- A single flush immediately following application
- A single flush after allowing one hour of drying time
- One to four flushes after allowing two hours of drying time

Results for CW762Y toilet with VC100 seat

- After a single flush immediately following application:
  No residual soil visible in test areas 1 - 7
- After a single flush following one hour of drying time:
  No residual soil visible in test areas 1 - 7
- After a single flush following two hours of drying time for the test substance:
  Little residual soil visible in test areas 1 – 7

WWW.DRZASTROW.DE
E-MAIL.:HYGIENE@DRZASTROW.DE
TELEFON: 0177/4113856 UND 030/130131200 • FAX: 030/36509804

- After two hours of drying time and two flushes:
  No residual soil visible in test areas 1 – 7

The test germs listed above were detected in all test areas with residual soil. Test areas without any residual soil did not contain any test germs.

Results for CW132Y toilet with VC130 seat

- After a single flush immediately following application:
  No residual soil visible in test areas 1 - 7
- After a single flush following one hour of drying time:
  No residual soil visible in test areas 1 - 7
- After a single flush following two hours of drying time for the test substance:
  Little residual soil visible in test areas 1 – 7
- After two hours of drying time and two flushes:
  No residual soil visible in test areas 1 – 7

The test germs listed above were detected in all test areas with residual soil. Test areas without any residual soil did not contain any test germs.

Results for conventional toilet with rim

- After a single flush immediately following application:
  Little residual soil visible in test areas
- After a single flush following one hour of drying time:
  Little residual soil visible in test areas 1 - 6
- After a single flush following two hours of drying time for the test substance:
  Residual soil visible in test areas 1 – 7
- After two hours of drying time and two flushes:
  Little residual soil visible in test areas 1 – 7
- After two hours of drying time and three flushes :
  Little residual soil visible in test areas 1 -- 7
- After two hours of drying time and four flushes:
  No residual soil visible in test areas 1 - 7

The test germs listed above were detected in all test areas with residual soil. Test areas without any residual soil did not contain any test germs.

2. Antibacterial effect of ceramic surfaces

Suspensions containing the following test germs were applied to the dry ceramic surfaces.

- Escherichia coli K12 NCTC 10538 = 2.1×10^3
- Enterococcus faecium ATCC 6057 = 2.8×10^3
- Pseudomonas aeruginosa ATCC 15442 = 4.7×10^3
- Acinetobacter baumanii = 2.6×10^3

After allowing the germs to react for one hour and two hours, RODAC blood agar plates were dabbed on the test surfaces. The incubation took place at 37°C over a 48-hour period.

- Was there a reduction in germs after one hour?
- Was there a reduction in germs after two hours?

Results
All tested surfaces still showed signs of the applied germs.
There was no significant difference in the growth of KBE on the RODAC blood agar plates between the ceramic surfaces of the TOTO toilets and the surface of the conventional toilet with rim after one or two hours of reaction time.

3. **At which contact points were the applied test germs still found following the flush?**
   The test organisms were not found on the underside of the TOTO toilet seat or its surroundings.
   The test organisms were found on the underside of the conventional toilet seat and its surroundings.

4. **Were test bacteria detected in the area surrounding the toilet following the flush?**

   Conventional toilet
   The applied microorganisms were found on the floor under the conventional toilet as well as nearby areas to the sides. Slight spray droplets were visible.

   TOTO CW762Y toilet with VC100 seat
   The test organisms were not found outside the TOTO toilet.
   Spray droplets were also not detected outside of the TOTO toilet.

   TOTO CF CW132Y toilet with VC100 seat
   The test organisms were not found outside the TOTO toilet.
   Spray droplets were also not detected outside of the TOTO toilet.

5. **Tolerance of cleaning and disinfection products**
   The concentration and application of the scour-wipe disinfection correspond to the RKI “Anforderungen an die Hygiene bei der Reinigung und Desinfektion von Flächen” (“Hygiene Requirements when Cleaning and Disinfecting Surfaces”) guidelines

   Do the disinfection processes cause visible changes or damage?

   The tolerance of ceramic surfaces from TOTO and surfaces of the conventional toilet were tested using different surface disinfectants from various manufacturers from the VAH list.

Result
The ceramic surfaces of the TOTO CW762Y toilet, the CF CW132Y and conventional toilet were not discoloured or altered by the disinfectants used.

Surface disinfectant	Concentration	Surface changes	
		Discolouration	Damage
Incidin® Perfekt	0.5%	no	no
Incidin® Rapid	0.5%	no	no
Incidin® Plus	0.5%	no	no

Incidin® Active	0.5%	no	no
Optisept®	0.5%	no	no
Optisal® N	0.5%	no	no
Biguanid Fläche N	0.5%	no	no
Milizid	Concentrate	no	no

	Active ingredient	Aldehyde-free
Incidin® Perfekt	Glyoxal, formaldehyde, glutaral, benzalkonium chloride, polyhexametyhlene biguanide	no
Incidin® Rapid	Glutaraldehyde, benzalkonium chloride, didecyldimethylammonium chloride	no
Incidin® Plus	Glucoprotamin	yes
Incidin® Active	Peracetic acid	yes
Optisept®	Methanal, ethandial, glutaraldehyde, didecyldimethylammonium chloride	no
Optisal® N	N-(3-aminopropyl)-N-dodecylpropan-1.3-diamin	yes
Biguanid Fläche N	Benzylalkyldimethylammonium chloride	yes
Alcohol 60%	Ethanol	yes
Milizid	Non-ionic surfactants	yes

6. Cleaning effort required with cleansers/disinfectants

The researchers were to evaluate how easily and quickly the surfaces of the TOTO and conventional toilets could be cleaned with disinfectants from the VAH list.

Result:

Since there was no visible residual soil on the test areas after an hour of drying time and a single flush, it was possible to clean and disinfect the surface very easily and quickly.

Summary of results

It was possible to thoroughly clean the ceramic surface and eliminate all soiled areas on the TOTO toilet quickly, easily and without great effort. For this reason, only very little time is needed for cleaning.

No spray droplets or test germs were detected in the direct surroundings of the TOTO toilets.

As such, using a rimless toilet equipped with the TOTO **Tornado Flush (with circling water)** essentially rules out the spread of gram-negative bacteria (intestinal germs).

When considering the special issues with MRGN, the technology in the **TOTO rimless CW762Y and CW132Y toilets** completely meets the standards of hospital hygiene and infection prevention, and is superior to the conventional toilet with rim and flush.

The TOTO toilet is a valuable component in a barrier system to prevent the spread of nosocomial pathogens.

Prof. Dr. med. Klaus- Dieter Zastrow
Doctor for Hygiene and Environmental Medicine