FROM LAB TO REALITY –
EXPERIENCE FROM TESTING A NEW LAUNDRY DETERGENT FOR CHEMICAL DISINFECTION AT LOW TEMPERATURE

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Objective

The objective was to test the microbicidal effect of a newly developed laundry detergent containing enzymes and peracetic acid, *in vitro* and *in vivo*. The inherent purpose was to determine if healthcare textiles can be laundered with this detergent at low temperature, with a disinfection effect that meets the requirements in Danish national guidelines (equaling 80°C at 10 min). The overall goal is to avoid energy-demanding disinfection at high temperature in washing machines.
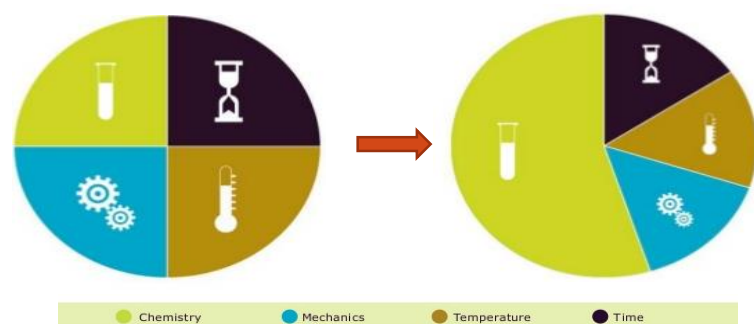

Figure 1. Sinners circle. Chemical composition becomes more important at low temperature.

Methods

1. The detergent was initially tested in the laboratory for microbicidal effect towards a panel of bacteria and fungi (EN 1276 and EN 1650).

2. Washing machine tests were performed on fabric samples at 40ºC, with high or low concentrations of bioburden, and using main wash with or without prewash (prEN16616).

3. *In vivo* studies were performed at healthcare end users comparing the test detergent with the normal laundry procedure.

Results - laboratory

Table 1. Overview of microorganisms tested at 40 ℃ using the disinfection standard tests (EN1276 and EN16450)	
Microorganisms tested	Disinfection ability (+/-) (min. log 5 reduction)
Pseudomonas aeruginosa ATCC 15442	+
Escherichia coli (K12) NCTC 10538	+
Staphylococcus aureus ATCC 6538	+
Enterococcus hirae ATCC 10541	+
Enterococcus faecium ATCC 6057	+
Candida albicans ATCC 10231	+

The microbicidal effect of the detergent met the requirements of a log 5 reduction. Requirements for *Aspergillus* could not be met.

Washing machine tests showed satisfactory reduction of bacteria on fabric and in flush water with low bioburden (Table 2), using main wash alone, whereas prewash was required for high bioburden conditions (Table 3).

Table 2. Effect of detergent during wash with low bioburden (40 ℃): Reduction of *E. coli* on fabric and in flush water?		
Detergent added	Yes	No
E.coli on fabric (log reduction)	> 7	< 1
E.coli in flush water (cfu/ml)	0	10⁶

Flush water
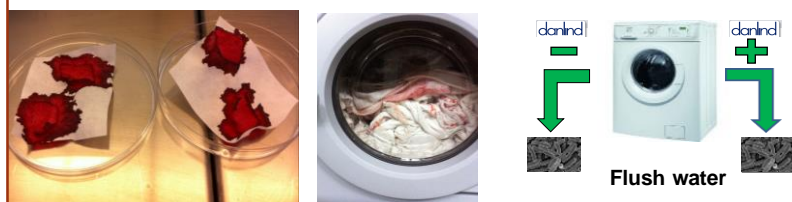
Table 3. Effect of prewash for reduction of *E. coli* on fabric with high bioburden (40 ℃).		
Prewash	Yes	No
E. coli on fabric (log reduction)	>6	3
Complete bacterial reduction on fabric	yes	no

Results - end users

Dentists, nursing homes and a hospital laundry participated in end user tests of the product. Current studies of dental practices show that national guidelines are not always followed, due to use of household machines and laundry procedures, which do not comply with guidelines for thermal disinfection.
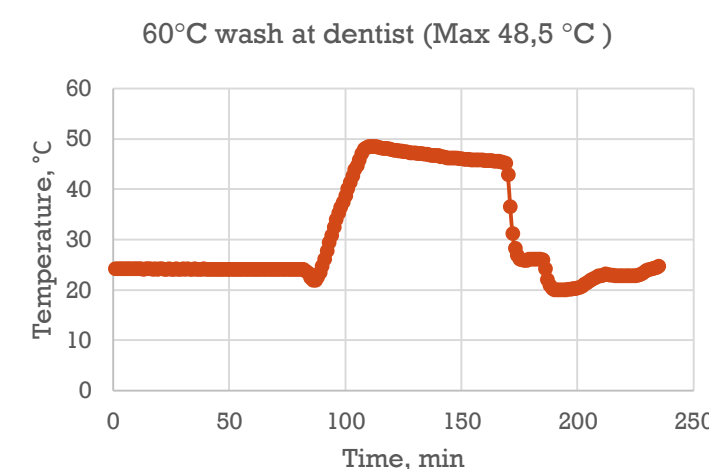

Figure 2. A typical temperature profile from a presumed 60 ℃ wash at a dentist's clinic.

- Bacterial load was reduced significantly at 40 °C with the test detergent (dental uniforms and hospital textiles).
- At 60°C complete disinfection was observed (medium-heavily soiled hospital textiles).

Conclusions

✓ The tested detergent had bactericidal and yeasticidal effect.

✓ High bioburden challenges the chemical effect of the detergent and requires increased mechanical effect (prewash).

✓ The widespread use of household machines and standard programs emphasize the need for detergents functioning at a wide variety of conditions even at lower temperatures.

✓ The test detergent met the criteria of laboratory-based disinfection and wash tests at 60ºC, but at 40ºC only by using prewash. 60ºC was needed for complete microbial reduction at end-user facilities.

Acknowledgments