



Prof. Dr. Mutters  
Institut Med. Mikrobiologie, Hans-Meerwein-Str. 2, D-35043 Marburg

**Prof. Dr. R. Mutters**

Manager Hospital Hygiene

Trolley Wash  
Sales & Marketing GmbH  
Fiecht-Au 31  
6134 Vomp  
Austria

Street address: Hans-Meerwein-Str. 2, 35043 Marburg  
Postal address: Postfach 2360, 35011 Marburg  
e-mail: Mutters@staff.uni-marburg.de

Marburg, 23rd of June 2011

**Hygiene certificate of the mobile shopping trolley cleaning system**  
***TROLLEY Wash all in one***

According to our mandate, we analysed whether the *TROLLEY Wash all in one* system from Feistmantl Cleaning Systems GmbH in Vomp, Austria meets the requirements of a hygienic cleaning according to HACCP.

Assuming that common shopping trolleys not only carry unwanted dirt from food scraps or loose residues, like paper, cardboard, tins, labels, cups (i.e. fruit or vegetables) but also diverse microbiological contaminations, a system was sought that can safely eliminate those contaminations from dirt and micro organisms. The client should thus be supplied with a shopping trolley that wouldn't impose a risk of infection or other health risk through harmful bacteria. In order to verify hygienic cleaning, tests were carried out based on the regulation for the „examination and evaluation of chemical disinfection processes“ of the German Society for Hygiene and Microbiology (DGHM) for a safe disinfection of the shopping trolleys with the *TROLLEY Wash all in one* system. The tests were carried out on the test organisms in analogy and according to the requirements of the German Society for Hygiene and Microbiology (DGHM) for disinfection methods in the biological stress test under realistic conditions.

## Test object

*TROLLEY Wash all in one* is a mobile shopping trolley cleaning system that consists of an automatic wash tunnel like the two models *TROLLEY Wash XL* and *M* that are already on the market.

This washing tunnel is mounted onto a chassis of a small truck and is therefore mobile. The system can also be used stationary. For both versions the same cleaning process technology applies, so the results presented in the report are transferable and are conformity.



The cleaning and disinfection process works fully automatic with water gyro jets and uniquely with rotating cleaning brushes.



Depending on the type of trolley (metal or plastic), degree of soiling and configuration up to 120 trolleys are washed and disinfected per hour.

The mobile shopping trolley cleaning system *TROLLEY Wash all in one* is easy to use (one-man-operation) and cost effective in operation. Due to the compact setup and the total weight of the truck of <7 tons *TROLLEY Wash all in one* is almost everywhere mobile, autonomous und flexibly deployable. *TROLLEY Wash all in one* can do up to 1,000 cleaning cycles / trolleys with one tank full of water.

The system provides the opportunity for a self-cleaning after and possibly before use, as required by the labour protection requirements such as for maintenance.

The *TROLLEY Wash all in one* system essentially consists of:

- Irrigation system
- Detergant dosage system
- Fixed and rotating cleaning water jets
- 2 rotating side brushes
- 1 rotating brush for the trolley handle bar
- 1 rotating brush for the inside of the basket
- Rinse nozzles
- Drying aid and disinfection

All steps in the cleaning process are fully automatic. Only the loading of the soiled trolleys and the unloading of the cleaned and disinfected trolleys into and from the system have to be done manually.

The length of the cleaning cycle can be adapted individually depending on the degree of soiling of the shopping trolleys.

### **Test set-up and performance:**

Standard trolleys were contaminated with the test germs on the relevant and assumedly hard to disinfect areas. For this 0.1 ml test germ suspensions absorbed in blood were applied on each selected area. The germs were absorbed in blood in order to simulate a biological load which would make the cleaning and disinfection more difficult. This was to prove that the system also works under exacerbated conditions.

After the tested areas on the trolleys were completely dry the trolleys were loaded into *TROLLEY Wash all in one* and cleaned therein. The tests were carried out with TROLLEY Carawash 789 with added shine dryer TROLLEY Carawash S. Carawash 789 is a lightly alkaline carwash based on sodium hydroxide solution and polycarboxylic acid by Feistmantl Cleaning Systems GmbH.

Subsequent to the cleaning a quantitative microbiological test was carried out with the recovery and culture tests.

## Test areas

- 1 – handle bar
- 2 – side grids external
- 3 – bottom grid
- 4 – front grid
- 5 – child seat, plastic seat



## Test germs

As test germs *Staphylococcus aureus* and *Enterococcus faecium* were used as representative of gram-positive pathogens (so called dry germs).

*Staphylococcus aureus* is a typical pathogen in wound infection. *Enterococcus* as well as the representative of the group “gramnegative intestinal germs” *Escherichia coli* are considered to indicate faecal contamination.

*Pseudomonas aeruginosa* was used as moist germ representing hospital-relevant germs. The yeast *Candida albicans* was included in the test in order to examine the reduction of yeast fungi. *Aspergillus niger* can cause infections in humans and which is also detectable in food and packaging. It is a typical representative of mould fungi species. For this test microorganism strains were used that are particularly specified from the DGHM for examining bactericidal and fungicidal effect.

<i>Staphylococcus aureus</i>	ATCC 6538
<i>Enterococcus faecium</i>	ATCC 5037
<i>Escherichia coli</i>	ATCC 11229
<i>Pseudomonas aeruginosa</i>	ATCC 15442
<i>Candida albicans</i>	ATCC 10231
<i>Aspergillus niger</i>	ATCC 16404

## Test germ concentration

<i>Staphylococcus aureus</i>	ATCC 6538	1,0 x 10 <sup>7</sup> cfu/ml
<i>Enterococcus faecium</i>	ATCC 6057	1,0 x 10 <sup>7</sup> cfu/ml
<i>Escherichia coli</i>	ATCC 11229	1,0 x 10 <sup>7</sup> cfu/ml
<i>Pseudomonas aeruginosa</i>	ATCC 15442	1,0 x 10 <sup>7</sup> cfu/ml
<i>Candida albicans</i>	ATCC 10231	1,0 x 10 <sup>7</sup> cfu/ml
<i>Aspergillus niger</i>	ATCC 16404	1,0 x 10 <sup>7</sup> cfu/ml *

\* cfu/ml = colony forming unit per ml

**Results:**

Each germ was applied to five different areas of the tested object so that all possible areas were covered. Each test was repeated.

***Staphylococcus aureus* ATCC 6538, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	7,00
2	germfree	7,00	germfree	7,00
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	7,00
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>7,00</b>

***Enterococcus faecium* ATCC 6057, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	5,50
2	germfree	7,00	germfree	5,92
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	5,96
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>6,28</b>

***Escherichia coli* ATCC 11229, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	7,00
2	germfree	7,00	germfree	7,00
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	7,00
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>7,00</b>

***Pseudomonas aeruginosa* ATCC 15442, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	7,00
2	germfree	7,00	germfree	7,00
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	7,00
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>7,00</b>

***Candida albicans* ATCC 10231, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	7,00
2	germfree	7,00	germfree	6,70
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	7,00
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>6,94</b>

***Aspergillus niger* ATCC 16404, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>cycle 60/h</i>		<i>cycle 80/h</i>	
	<i>Result</i>	<i>Reduction rate log-grades</i>	<i>Result</i>	<i>Reduction rate log-grades</i>
1	germfree	7,00	germfree	7,00
2	germfree	7,00	germfree	7,00
3	germfree	7,00	germfree	7,00
4	germfree	7,00	germfree	7,00
5	germfree	7,00	germfree	7,00
<b>Total reduction rate</b>		<b>7,00</b>		<b>7,00</b>

**Assessment:**

The microbiological results obtained in the tests with test bacteria contamination under biological load show that the mobile shopping trolley cleaning system *TROLLEY Wash all in one* ensures a very good hygienic treatment.

For all tested types of germs in a 60 trolleys per hour cycle a reduction of 7 log-grades could be achieved; in a 80 trolleys per hour cycle a reduction of 6,87 log-grades could be achieved. Both values exceed the required reduction of 5 log-grades for a disinfecting treatment.

The *TROLLEY Wash* system is to be recommended for a disinfecting cleaning of shopping trolleys as it guarantees the safety and microbiological innocuousness of the transported goods as well as safety for the user of the trolley. Considering that the HACCP concept reaches the end consumer to be able to guarantee harmless groceries, the regular use of the *TROLLEY Wash* system implies the elimination of a critical control aspect in this concept.

Against the backdrop of actual facts, legal and hygienic requirements and current developments a routine disinfectant cleaning of shopping trolleys is strongly recommended.

The obtained very good results are due to the unique concept to perform fully automatic cleaning and disinfection by means of rotary nozzles and rotating brushes. Only through this procedure it is possible to achieve the high process quality, different from a pure spray nozzle system which cannot achieve such an intense process-related treatment. With the cleaning system *TROLLEY Wash all in one* 100% process reliability as well as constant cleaning and hygiene result up to the last trolley can be achieved.

This Hygiene certificate of the mobile shopping trolley cleaning system *TROLLEY Wash all in one* is valid for three years.

Marburg, 23<sup>rd</sup> of June 2011



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Institut Med. Mikrobiologie, Hans-Meerwein-Str. 2, D-35043 Marburg

**Prof. Dr. R. Mutters**

Leiter Krankenhaushygiene

Trolley Wash  
Sales & Marketing GmbH  
Fiecht-Au 31  
6134 Vomp  
Austria

Hausanschrift: Hans-Meerwein-Str. 2, 35043 Marburg  
Postanschrift: Postfach 2360, 35011 Marburg  
e-mail: Mutters@staff.uni-marburg.de

Marburg, 23<sup>rd</sup> of June 2011

**Pre-testing of the mobile shopping trolley cleaning system**  
***TROLLEY Wash all in one***

**Initial situation:**

In June 2008 the Hygiene Institute of the Marburg University Hospital conducted sample tests on shopping trolleys in German food retail markets. In those tests bacteria, germs and moulds were detected with high germ count in many cases which can constitute an impairment of health to people. As a result this problem has led to defining efforts to improve the hygiene situation and ensure the safety of customers and products. A cleaning system for shopping trolleys represents a suitable solution.

**Question:**

- 1. Disinfection or cleaning**
- 2. Cycle times of the system**

Prior to the actual tests it should be clarified whether a sole cleaning of the trolleys with high pressure without disinfection is sufficient in order to achieve the required hygienic safety. In addition it should be clarified at what throughput quantities a disinfecting cleaning of the trolleys can be assured. 60 and 80 trolleys per hour were selected.

**Test set-up and performance**

For the pre-testing four critical areas on the shopping trolley were selected and contaminated with standard bioindicators for the testing of cleaning systems. These test areas (metal spatula) were selectively contaminated with a suspension consisting of *Enterococcus faecium* ATCC 6057 in sheep blood ( $1,0 \times 10^7$  cfu/ml\*). The germs were absorbed in blood in order to simulate a biological load which would make the cleaning and disinfection more difficult.

This was to prove that the system also works under exacerbated conditions. Subsequent to the cleaning a quantitative microbiological test was carried out with the recovery and culture tests.

\* cfu/ml = colony forming units per millilitre

### Test objects:

- 1 – Handle bar
- 2 – Bottom grid
- 3 – External side grid
- 4 – Front grid



### Results:

**Bio indicator with *Enterococcus faecium* ATCC 6057, concentration  $1,0 \times 10^7$  cfu/ml**

	<i>Disinfection cycle 60/h</i>	<i>Disinfection cycle 80/h</i>	<i>Only cleaning cycle 60/h</i>
1	germfree	germfree	growth
2	germfree	germfree	growth
3	germfree	germfree	growth
4	germfree	growth	growth

### Assessment:

The test revealed one problem. The front area of the trolleys was not sufficiently disinfected with the selected cycle times. The program was immediately modified that a longer stand time was programmed for this particular area. The subsequent tests confirmed the success of this measure. (please refer to the certificate *TROLLEY Wash all in one* from 23<sup>rd</sup> of June 2011).

The sole cleaning of the shopping trolleys with high pressure devices without disinfection can not be recommended. Without disinfection all test areas were still contaminated and loaded with blood even after the cleaning cycle.

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e-mail: Mutters@staff.uni-marburg.de

Marburg, 23<sup>rd</sup> of June 2011

**Hygiene certificate on the hygiene safety technology for the mobile shopping trolley cleaning system *TROLLEY Wash all in one***

According to our mandate, we analysed whether the *TROLLEY Wash all in one* system from Feistmantl Cleaning Systems GmbH in Vomp, Austria meets the requirements for hygienic self-cleaning.

**Test object**

The mobile shopping trolley cleaning system *TROLLEY Wash all in one* consists of an automatic washing tunnel (like a car wash). This washing tunnel is mounted onto a chassis of a small truck and is therefore mobile. The system can also be used stationary. For both versions the same cleaning process technology applies, so the results presented in the certificate are transferable and are conformity.

The cleaning and disinfection process works fully automatic with water gyro jets and uniquely with rotating cleaning brushes.

The mobile shopping trolley cleaning system *TROLLEY Wash all in one* is easy to use (one-man-operation) and cost effective. Due to the compact setup and the total weight of the truck of <7 tons, *TROLLEY Wash all in one* is almost everywhere mobile, autonomous und flexibly deployable.

All steps in the cleaning process are fully automatic. Only the loading of the soiled trolleys and the unloading of the cleaned and disinfected trolleys into and from the system have to be done manually.

*TROLLEY Wash all in one* can do up to 1,000 cleaning cycles / trolleys with one tank full of water.

The TROLLEY Wash all in one system essentially consists of:

- Irrigation system
- Detergant dosage system
- Fixed and rotating cleaning water jets
- 2 rotating side brushes
- 1 rotating brush for the trolley handle bar
- 1 rotating brush for the inside of the basket
- Rinse nozzles
- Drying aid and disinfection

### **Test set-up and performance:**

For the inspection five critical areas were selected inside the trolley wash system. Those areas are from experience the most difficult ones for a proper disinfection and cleaning. These test areas were selectively contaminated with a suspension consisting of *Enterococcus faecium* ATCC 6057 in sheep blood ( $1,0 \times 10^7$  KBE/ml\*). For this 1 ml test germ suspensions absorbed in blood were applied on each selected area. The germs were absorbed in blood in order to simulate a biological load which would make the cleaning and disinfection more difficult.

This was to prove that the system also works under exacerbated conditions. After the test areas were completely dry, the cleaning machine was put in operation and one wash cycle was carried out without trolleys.

Subsequent to the cleaning a quantitative, microbiological examination in the recovery and culture tests was carried out.

\* cfu/ml = colony forming units per millilitre

### **Test objects**

- 1 – Wall sheet inside – where spray nozzles with disinfectant are located
- 2 – Longitudinal beam in the centre of the cleaning system
- 3 – Transverse bearing rail above 1,50 m
- 4 – Buffer plate where spray nozzles for the rinse component are located
- 5 – Rail for spray nozzle holder

## Results

***Enterococcus faecium* ATCC 6057, initial concentration  $1,0 \times 10^7$  cfu/ml**

	<i>Result (cfu/ml)</i>
1	germfree
2	germfree
3	germfree
4	germfree
5	germfree

## Assessment

The hygiene test demonstrates that the self cleaning mechanism of the *TROLLEY Wash all in one* system provides a level of security which can be expected for example by a service technician when working inside the system.

Prior to the daily use and after finishing the daily cleaning business a self cleaning cycle should be carried out, as well as prior to technical or service.

This Hygiene certificate on the hygiene safety technology for the mobile shopping trolley cleaning system *TROLLEY Wash all in one* is valid for three years.

Marburg, 23rd of June 2011



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