

To  
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## **SURFACE DISINFECTION ANALYSIS**

Date of sampling: 26/05/2020

### **OBJECT**

The surface disinfection analysis is made by using the machineries: HERA PLUS (6BAR) and ATHENA 8 PLUS (8BAR), and different tools with or without IDRO-SAN (hydrogen peroxyde). In all cases the movement of machine is been 20 cm/sec.

### **TESTS CARRIED OUT**

Tested surfaces:

CONCRETE FLOOR; MOQUETTE; WOOD; CACHEMIRE; GLASS; FLOOR TILES.

The surfaces were previously contaminated with *Escherichia coli*, a bacterial species whose natural habitat is the human and animal intestines. Its presence is an indicator of fecal contamination and is often found on surfaces and work environments (offices, shops, public places), if not properly sanitized. For this reason, it is used as a microbial target to evaluate the disinfection of surfaces (Reynolds et al., 2005).

The ISO 18593: 2018 was used as reference sampling technique: "horizontal methods for surface sampling": swabs were used for sampling a fixed area for all samples (10 cm x 10 cm). All surfaces were analysed a  $t_0$ , that is a non-disinfected area as a control. Where possible the analysis were made in duplicate.

#### **- CONCRETE FLOOR**

Both machines (HERA PLUS and ATHENA 8 PLUS) were used with universal floor brush making 2 or 4 passages (back and forth) with steam injection and recovery and also adding IDRO-SAN.

#### **- MOQUETTE**

HERA PLUS (6 bar) was used with steaming turbo brush making 2 and 4 passages with steam injection and recovery and also adding IDRO-SAN. On this surface was analysed also vertical ironing brush with steam injection brushing the surface.

#### **- WOOD**

HERA PLUS (6 bar) 2 and 4 passages with universal floor brush (standard) with steam injection and recovery.

#### **- FLOOR TILES**

HERA PLUS (6 bar) making 3 passages of steam injected from multifunctional brush with microfiber mop.

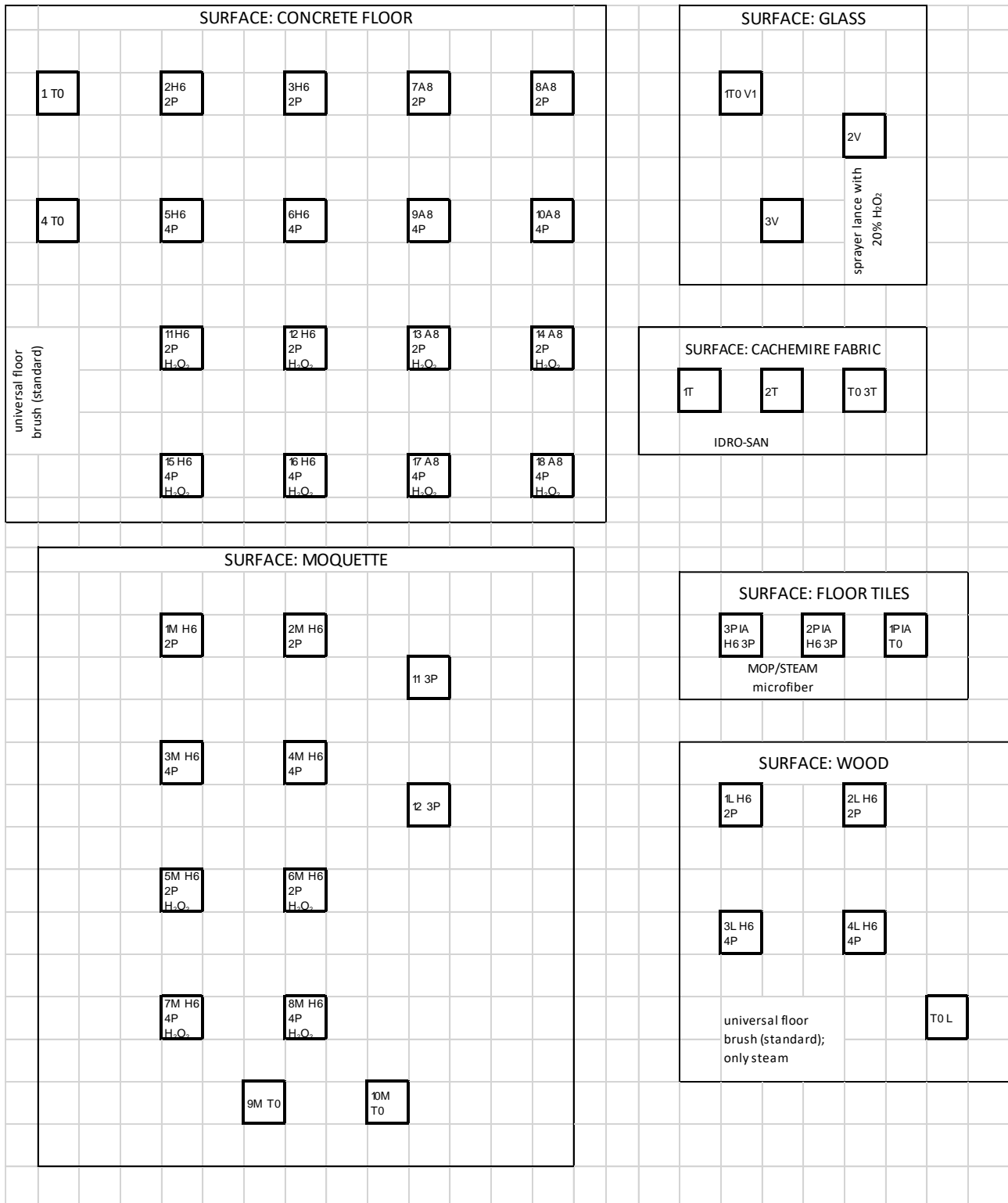
- GLASS

This surface was cleaned using sprayer lance with tank, using steam and IDRO-SAN sprayed at a distance of 80cm.

- CACHEMIRE

This tissue was treated directly with IDRO-SAN, the product was sprayed with spray bottle.

In figure 1 is schematized the position of all the samples analysed on the different surfaces and the position of all the swabs made.



**Figure 1:** Graphic representation of surface areas analysed. The squares are surfaces of 10cmx10cm. T0=surface contaminated with *E.coli* but not treated, used as a control. P=Passage (back and forth). H6=HERA PLUS (6 BAR). A8=ATHENA 8 PLUS (8BAR). L=WOOD. PIA=FLOOR TILES. M=MOQUETTE. T= CACHEMIRE FABRIC. V=GLASS.

## RESULTS

### SURFACE: WOOD

The use of HERA PLUS (6BAR) in 2 or 4 passage did not show differences regarding the disinfectant efficacy (table 1). In both cases there was a decrement of at least 3 logarithms, from 4,18 to <1, this means a % log reduction of 99,92% of bacterial count.

SWAB	TREATMENT	WOOD			Log reduction
		cfu/ml	log <sub>10</sub>	% reduction	average%
TOL		1,50E+04	4,18		
1L	2P;H6	<10	<1	99,92	>99,92
2L		<10	<1	99,92	
3L	4P;H6	<10	<1	99,92	>99,92
4L		<10	<1	99,92	

**Table 1**\_The table shows the results obtained on surface “WOOD”.





**SURFACE: GLASS**

Sprayer lance with tank with steam and IDRO-SAN 20% from 80 cm of distance from the glass surface has an high disinfectant power. There was a bacterial count decrement of at least 5 logarithms, from 6 to <1, this means a % reduction of at least 99,999% (Figure 2).

SWAB	TREATMENT	GLASS SURFACE			Log reduction average %
		cfu/ml	log <sub>10</sub>	% reduction	
1TOV1		6,36E+06	6,80		
2V	sprayer lance, 20%H <sub>2</sub> O <sub>2</sub>	<10	<1	99,999	>99,999%
3V		<10	<1	99,999	

**Table 3\_** The table shows the results obtained on surface GLASS.



## SURFACE: FLOOR TILES

Among the various treatments analyzed, the use of the steam MOP with a 5 m tube, in particular using the HERA PLUS machine (6BAR) and 3 passages with steam and microfibre mop, resulted in a bacterial count decrease of about 2 logarithms, from 5 to 3, this is equivalent to a % reduction of approximately 98.5% (table 4). This result can be explained by the fact that the 5 m tube, while improving the handling of the accessory, generates a drop in temperature on the treated surface compared to the 2,5m ones supplied as standard accessory.

SWAB	TREATMENT	FLOOR TILES			Log reduction
		cfu/ml	log <sub>10</sub>	% reduction	average %
T03PIA		1,00E+05	5,00		
1PIA	MOP; STEAM MICROFIBER	9,00E+02	2,95	99,00	98,50%
2PIA		2,00E+03	3,30	98,00	

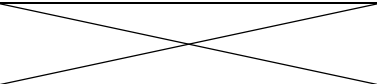
**Table 4\_** The table shows the results obtained on surface FLOOR TILES.



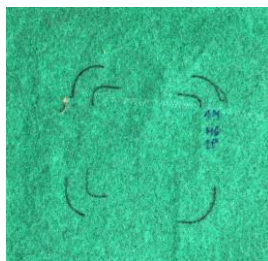
## SURFACE: MOQUETTE

The test on MOQUETTE (results on Table 5) showed a higher disinfectant effect with the addition of IDRO-SAN (hydrogen peroxyde). The use of IDRO-SAN allowed a decrement of the bacterial count of at least 5 logarithms, from 7 to <2, this means a % reduction of at least 99,999%. In the absence of IDRO-SAN the maximum % of bacterial count reduction was 99,35%.

The use of vertical ironing brush with steam injection, brushing the surface in 3 passages, determined a 99,999% of bacterial count reduction, reduction of about 5 logarithms.

SWAB	TREATMENT	MOQUETTE			Log reduction
		cfu/ml	log <sub>10</sub>	% reduction	average
T09M		6,04E+07	7,78		7,76
T010M		5,52E+07	7,74		log <sub>10</sub> /ml
1M	H6;2P	1,00E+05	5,00	99,70	99,35%
2M		6,00E+05	5,78	99,00	
3M	H6;4P	3,30E+06	6,52	92,00	95,65%
4M		2,00E+05	5,30	99,30	
5M	H6;2P;H <sub>2</sub> O <sub>2</sub>	<100	<2	99,999	>99,999%
6M		<100	<2	99,999	
7M	H6;4P;H <sub>2</sub> O <sub>2</sub>	<100	<2	99,999	>99,999%
8M		<100	<2	99,999	
11M	vertical ironing brush, steam, 3P	<100	<2	99,999	>99,999%
12M		<100	<2	99,999	

**Table 5\_** The table shows the results obtained on the surface of MOQUETTE.





## SURFACE: CONCRETE FLOOR

In all cases, on CONCRETE FLOOR there was a decrement of at least 5 logarithms, from 6 to <1 of bacterial count, this means a reduction % of at least 99,999% (table 6).

SWAB	TREATMENT	CONCRETE FLOOR			<i>Log reduction</i>
		cfu/ml	log <sub>10</sub>	% reduction	average
T0#1		1,60E+06	6,20		6,14 log <sub>10</sub> /ml
T0#4		1,20E+06	6,08		
#2	H6;2P	4,00E+01	1,60	99,9995	99,9997 %
#3		<10	<1	99,9999	
#5	H6;4P	<10	<1	99,9999	>99,9999 %
#6		<10	<1	99,9999	
#7	A8;2P	<10	<1	99,9999	>99,9999 %
#8		<10	<1	99,9999	
#9	A8;4P	<10	<1	99,9999	>99,9999 %
#10		<10	<1	99,9999	
#11	H6;2P;H <sub>2</sub> O <sub>2</sub>	<10	<1	99,9999	>99,9999 %
#12		<10	<1	99,9999	
#13	A8;2P;H <sub>2</sub> O <sub>2</sub>	<10	<1	99,9999	>99,9999 %
#14		<10	<1	99,9999	
#15	H6;4P;H <sub>2</sub> O <sub>2</sub>	<10	<1	99,9999	>99,9999 %
#16		<10	<1	99,9999	
#17	A8;4P;H <sub>2</sub> O <sub>2</sub>	<10	<1	99,9999	>99,9999 %
#18		<10	<1	99,9999	

**Table 6\_** The table shows the results obtained on the surface of CONCRETE FLOOR.



## CONCLUSION

Disinfection means reduction of pathogenic microorganisms to a level that does not cause infections in humans. European standards (EN standard) consider the disinfectant/biocidal action effective when occurs a microbial reduction of the logarithmic value  $> 4$  corresponding to a 99.99% (ISS Report COVID-19, n. 19/2020).

From our results, we can deduce that the use of IDRO-SAN together with steam has a better disinfectant effect. The disinfectant effect depends on the treated surface.

On the "concrete" surface both machines (H6 and A8), using the universal floor brush (standard) with 2 passages and 4 passages, have reduced the bacterial count by at least 99.999%.

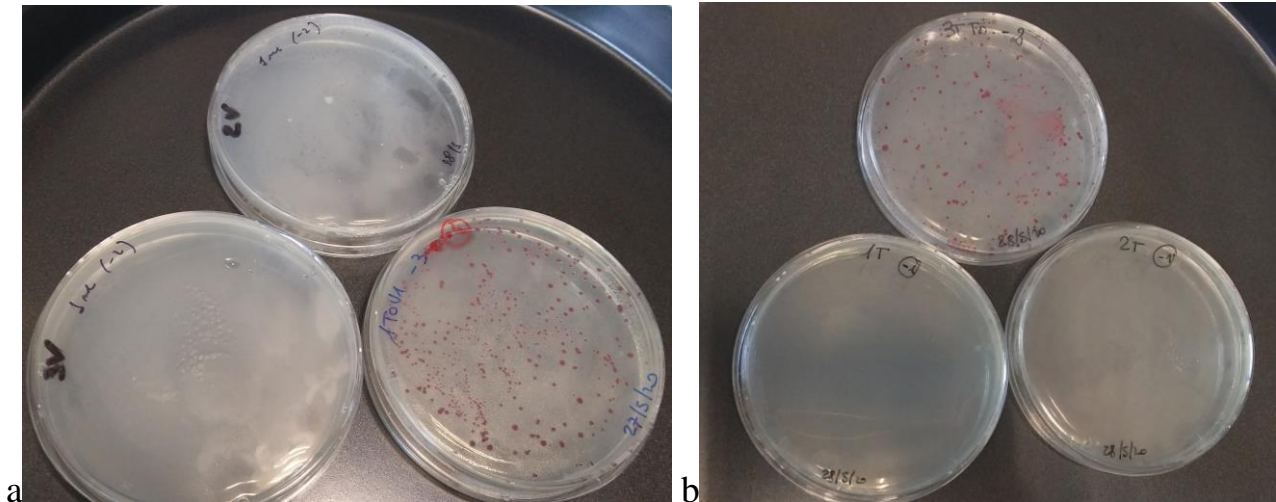
On the "CARPET" surface, the use of HYDRO-SAN allows to achieve a reduction of at least 99.999% of the bacterial load. Even the use of the vertical steam brush (only steam) in 3 passages allowed a reduction in the bacterial count  $>$  of 99.999%.

On the tiles floor, on the other hand, the 3 passages with the MOP-steam on the HERA PLUS machine (6BAR) allowed a 98.5% decrease of the bacterial count.

On glass, the reduction is at least 99.999% of bacteria.

The effect of IDRO-SAN spray on the surfaces of the fabrics (cashmere) is equivalent to a reduction of more than 99.90% of the bacteria present on the surface.

The use of the HERA PLUS machine (6BAR) in 2 or 4 passes on the wood has allowed a reduction of at least 99.90% of the microbial count.



**Figure 2:** Petri plate (medium\_PCA added with Cycloheximide) after 2 days of incubation at 37°C. (a) “GLASS” surface; (b) FABRIC “Cachemire”.



**Figure 3:** HERA PLUS e ATHENA 8 PLUS; IDRO-SAN.

## References

- Reynolds K.A., Watt P.M., Boone S.A., Gerba C.P., 2005. Occurrence of bacteria and biochemical markers on public surfaces. *Int. J. Environ. Health Res.*, 15: 225-34.
- UNI EN ISO 18593:2018: Microbiologia della catena alimentare - Metodi orizzontali per il campionamento di superficie.
- Rapporto ISS COVID-19, n. 19/2020. “Raccomandazioni ad interim sui disinfettanti nell’attuale emergenza COVID-19: presidi medico chirurgici e biocidi”.