AQUALUTION®

Project title	Terminal disinfection using HOCl applied as a mist		
Sector	Healthcare - NHS	Collaborator	An NHS Hospital
Participants	ML, NM, Chris, Adam, Jillie, Andrew, Tommy		
Start date	5/5/2021	Location	Paediatric Ward

Project aim

The aim of the project was to measure the effect of misting Salvesan hypochlorous acid on the microbial loading across a range of hand/touch surfaces in previously cleaned and disinfected patient rooms. Two single occupancy patient rooms were chosen. Both rooms were misted with Salvesan hypochlorous acid at the rate of 3ml/m^3 but each room was misted with a different machine: room 1 was misted with the Entex machine; Room 2 was misted with the Sanilution machine (aka "the barbeque"). Both machines use ultrasonic technology to generate the mist particles. The particles are very small (~5-8 microns) which allows them to circulate thoroughly around the room. Additionally, the particles are so fine that they do not cause wetness on surfaces or floors.

Methodology

The chosen rooms had been cleaned then disinfected with Actichlor Plus (1000ppm bleach). Room one was cleaned and disinfected on 4/5/2021. Room 1 volume was approximately 45m^3. Room two was cleaned and disinfected on 23/4/2021. Room 2 was slightly smaller (volume 40m^3).

Microbial swabs were taken – both ATP for instant measurement and traditional microbiology swabs which were couriered to the lab (One Scientific, Avonmouth) and analysed for aerobic colony counts. Swabs were taken before and after misting with Salvesan. Both rooms were misted with Salvesan for 4 minutes then left for a 5 minute dwell time prior to taking the post treatment swabs.

Conventional microbiology

Traditional swabs were taken at each site in the rooms in their "as found" condition. Templates were used to ensure that the pre and post misting sampling swab area was the same. Some areas were discreet so the whole area was swabbed (eg the light switch). Another set of swabs was taken, by the same person (Michelle), after the misting treatment. Ten surfaces were chosen in room 1 and nine surfaces were chosen in room 2, shown below in the table:

ROOM 1		ROOM 2	
Surface	**Material**	**Surface**	**Material**
Bedside cabinet	Veneer	Door handle (internal)	Stainless steel
Cot bed	Plastic coated metal	Light switch	Plastic
Phone headset	Plastic	Glove dispenser	Plastic coated metal
Chair	PVC	Soap dispenser	Plastic
Whiteboard	Plastic coated fibreboard	Bedside cabinet	Veneer
Soap dispenser	Plastic	Phone headset	Plastic
Glove dispenser	Plastic coated metal	Chair	PVC
Door handle (internal)	Stainless steel	Bed rail	Metal
Light switch	Plastic	Spine of folder at end of bed	Plastic
Bin Lid	Plastic coated metal		

ATP testing

Pre and post misting swabs were taken from a range of surfaces by Jillie (room 1) and Tommy (room 2). The surfaces are shown below:

ROOM 1		ROOM 2	
Surface	**Material**	**Surface**	**Material**
Sink	Ceramic	Bed side cabinet	Wood veneer
Key pad on medicine safe	Stainless steel	Sink	Ceramic
Dial on oxygen cylinder	Glass	Chair handle	Wood
Top of bin - 1	Plastic coated metal	Bed rail	Metal
Top of bin - 2	Plastic coated metal		
Switch behind bed	Brushed steel		

Results

All swabs (conventional microbiology and ATP) taken were successfully analysed.

Room 1

Results of the traditional microbiology are shown in the table below, expressed as both colony forming units (cfu) per swab and log counts.

	ACC (cfu/swab)		Log	
Swab site	**Pre**	**Post**	**Pre**	**Post**
Bedside cabinet	120	**<10**	2	0
Cot bed	790	**<10**	2	0
Phone	**<10**	**<10**	0	0
Chair	70	**<10**	1	0
Whiteboard	**<10**	**<10**	0	0
Soap dispenser	**<10**	**<10**	0	0
Glove dispenser	**<10**	**<10**	0	0
Door handle	**<10**	**<10**	0	0
Light switch	**<10**	**<10**	0	0
Bin lid	600	**<10**	2	0

The results demonstrate that 60% of the previously cleaned areas tested had a count of <10cfu/swab prior to misting. The areas still harbouring bacterial contamination were the bedside cabinet, the bed rails and the bin lid. Swabs taken after misting show that this contamination has been successfully removed.

Results of the ATP swabs are shown below:

	ATP reading (RLU)	
Swab site	**Pre**	**Post**
Sink	13	7
Key pad on medicine safe	322	87
Dial on oxygen cylinder	22	8
Top of bin 1	570	0
Top of bin - 2	795	99
Switch behind bed	0	

All ATP readings went down after misting.

Room 2

Results of the traditional microbiology are shown in the table below, expressed as both colony forming units (cfu) per swab and log counts.

	ACC (cfu/swab)		Log	
Swab site	**Pre**	**Post**	**Pre**	**Post**
Door handle (internal)	210	30	2	1
Light switch	10	**<10**	1	0
Glove dispenser	**<10**	**<10**	0	0
Soap dispenser	**<10**	**<10**	0	0
Bedside cabinet	410	**<10**	2	0
Phone headset	**<10**	**<10**	0	0
Chair	160	20	2	1
Bed rail	2270	**<10**	3	0
Spine of folder at end of bed	2700	40	3	1

The results demonstrate that a third of the areas tested prior to misting had a count of <10cfu/swab. The areas still harbouring bacterial contamination were the door handle, light switch, bedside cabinet, chair, bed rail and folder. Swabs taken

after misting show that two thirds of the areas were very clean with the remaining three showing very low levels of contamination. The most contaminated two areas were the bed rail and the spine of the patient folder. Misting successfully removed 99 – 99.9% (2 – 3 logs) of the bacteria present in these areas. On average, the pre cfu count was 640 cfu and the post cfu count was 10 cfu so misting conferred a 1 log benefit / 90% reduction. The median pre values were 160 cfu and post values were 0 cfu indicating a 2 log reduction (99% removal).

Results of the ATP swabs are shown below:

	ATP reading (RLU)	
Swab site	**Pre**	**Post**
Bed side cabinet	256	102
Sink	1	2
Chair handle	274	161
Bed rail	21	9

Three of the four readings went down after misting. One area rose from 1 to 2 which is within the bounds of sampling error and not considered to be a genuine increase.

Conclusions

The rooms were clean when we arrived. However, our swabbing showed that over half of areas sampled (10/19 areas) had microbial counts of >10cfu/swab. After misting with Salvesan the number of sites with contamination present in excess of 10cfu/swab was 3/19 (~15%). The total number of bacteria enumerated was 7340 cfu in the 19 pre samples and 90 cfu in the 19 post misting samples. This is a 2 log reduction (99%) in a previously cleaned and sanitised area. Misting with Salvesan confers consistent benefits when used in addition to traditional hygiene measures.