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GWALIA HEALTHCARE

Innovative Solutions for Infection Control

Service Bus Assessment for Viral and Pathogenic Transport Between Users

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1. Abstract

Two service buses were used as test cases to analyse bacterial contamination pre and post decontamination using a handheld airless sprayer and Hybrisan's advanced non-alcohol sanitisers. The presence of bacteria and the way that cross-contamination is achieved was considered as a reasonable model for the transport of pathogenic organisms (including Coronavirus) in a system. Both Hybrisan Surface + Hands and Hybrisan Super Concentrate Sanitiser were successful in eradicating bacteria, yeast and mould on the service buses tested and a decontamination regime is recommended.

2. Introduction

The client is a large local transport operator who is keen to ensure that their customers and staff are suitably protected against the potential risk of contracting Coronavirus from within the confines of a service bus. We at Hybrisan were asked to implement a testing regime to assess the bacterial cleanliness of service buses after shift change. Testing for virus on surfaces is complex and outside the scope of this trial. However, bacterial presence can be considered as a strong indicator of how pathogens can be transmitted via cross-contamination between users.

Two services buses were selected as test cases for assessment:

- Bus 1: Single Decker
- Bus 2: Double Decker

Our approach was to determine key high contact touch points and to assess the bacterial load present at these points pre and post decontamination using Hybrisan's polymeric Biocides and a hand-held airless sprayer as a delivery mechanism.

3. Aims

The aims of this assessment were to:

- Determine high contact regions between passengers and the internal superstructure of a service bus.
- Use surface dip-slides to assess bacterial load at the high contact points pre-decontamination.
- Use airless sprayers to treat all high contact point with a view to decontamination and to repeat surface dip-slides to recover any remaining bacterial load.
- Incubate dip-slides and assess variation in bacterial contamination Pre and Post decontamination.
- Evaluate the data collected from the slides to determine levels of decontamination.

4. Methodology

In this case bacteria was used as an indicator for pathogenic cross-contamination as viral detection on a surface was beyond the scope of the analysis.

The procedure used for data collection and analysis was conducted as follows

1. Visual assessment of the service bus cabin to indicate high touch points. Touch points presented in appendix.
2. Surface dip-slides used to recover bacterial load pre-treatment
3. A handheld airless sprayer was used to dispense Hybrisan's polymeric biocidal surface treatment.
4. Surface dip-slides used to recover any remaining bacterial load post treatment.

Dip-slides used: BTM2 Surface Dipslides – Nutrient TTC + Malt Extract for the recovery of bacteria, yeasts, moulds and fungi.

All dip-slides were then removed from the test site and incubated in the laboratory at Hybrisan's facility. The slides were then incubated at 30 degrees C for 120 hours to facilitate bacteria, yeast and mould growth.

5. Results and Discussion

5.1. Bus 1

Sample Point	Bacterial Load (CFU/cm^2)*		Yeast Load (CFU/cm^2)		Mould Load	
	Pre	Post	Pre	Post	Pre	Post
1	1	<0.1	3	<0.1	None	None
2	<0.1[1]	<0.1	0	<0.1	None	None
3	12	<0.1	0	<0.1	Light	None
4	8	<0.1	4	<0.1	Medium	None
5	<0.1	<0.1	0	<0.1	Light	None
6	1	<0.1	0	<0.1	Light	None

*Colony Forming Units/cm^2

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[1] Limit of sensitivity – where there was no growth on the dipslide the minimum reportable CFU/cm^2 was 0.1 therefore these were reported as <0.1

There was minimal bacteria recovered from Bus 1. There was low bacteria and light mould load from sample point 1 (entrance hand rail) and sample point 6 (seat back handle). There were slightly higher levels of bacteria recovered from sample point 3 (hand rail) and sample point 4 (seat back) with light and medium mould load respectively.

The bus was decontaminated with Hybrisan Surface + Hands through a handheld battery operated Graco airless sprayer. This took 7 minutes for 2 consecutive sweeps using approximately 250ml of sanitiser.

There was no detectable bacteria, yeast or mould recovered after decontamination. This indicated up to a 99.2% reduction of load however given there was nothing recovered post treatment it is expected the reduction potential is considerably greater.

5.2. Bus 2

Sample Point	Bacterial Load (CFU/cm^2)		Yeast Load (CFU/cm^2)		Mould Load	
	Pre	Post	Pre	Post	Pre	Post
1	8	<0.1	<0.1	<0.1	Medium	None
2	9	<0.1	<0.1	<0.1	Light	None
3	100	<0.1	<0.1	<0.1	Light	None
4	12	<0.1	12	<0.1	Light	None

There was considerably more bacteria recovered from bus 2. There were medium levels of bacteria at sample point 1 (glass divider), sample point 2 (stairs grab rail) and sample point 4 (grab rail) with medium, light and light mould respectively. There were medium levels of yeast load recovered from sample point 4 (grab rail). Sample point 3 (carpeted wall) was significantly more contaminated with 100 CFU/cm^2 of bacteria load.

The bus was decontaminated with Hybrisan Super Concentrate Surface through a handheld battery operated Graco airless sprayer. This took 7 minutes for 2 consecutive sweeps using approximately 500ml of sanitiser.

There was no detectable bacteria, yeast or mould recovered after decontamination. This indicated up to a 99.9% reduction of load however given there was nothing recovered post treatment it is expected the reduction potential is considerably greater.

6. Recommendations

6.1. General Recommendations

1. The bus should be cleaned regularly, this includes all porous and non-porous services to ensure there is no dirt, grime or dust settlement.

2. The results from Bus 2 sample point 3 (carpeted wall) suggest that this type region is of serious concern and should be reviewed for adequate decontamination. The dust settlement in this area will lead to bacterial load and should be decontaminated and vacuum cleaned regularly.

6.2. Decontamination Recommendations

1. The bus should be effectively decontaminated using a handheld airless sprayer. This can be conducted before and/or after service daily using Hybrisan Super Concentrate Surface Sanitiser.

2. Extra attention should be given to high contact areas throughout the day using a compatible product to ensure the residual protection is not deteriorated. This should be done regularly using either Hybrisan Surface + Hands or Hybrisan Super Concentrate Sanitiser to top up high touch areas with protection throughout the day.

3. The use of Hybrisan Hand + Surface Sanitiser should be encouraged for all passengers to ensure residual protection is not deteriorated by incompatible products such as alcohol sanitisers.

7. Conclusions

Both test cases exhibited bacteria contamination on pre-treated surfaces and showed significant reduction in contamination post treatment. However, the dip-slides used in this analysis have limited sensitivity for a complete understanding of the problem due to the low sensitivity in detection. It is expected with a more thorough analysis higher reductions could be reported. Hard high contact regions should not be fixed to fabrics or carpet areas. The handheld airless sprayer was suitable for rapid decontamination.

By using a complete range of products ongoing residual protection can be maintained without deterioration due to product incompatibility. The Hybrisan range of sanitisers ensure that protection is passed between all hands and surfaces offering ongoing protection against pathogenic organisms whilst its multi material compatibility ensures surfaces are not damaged or compromised.
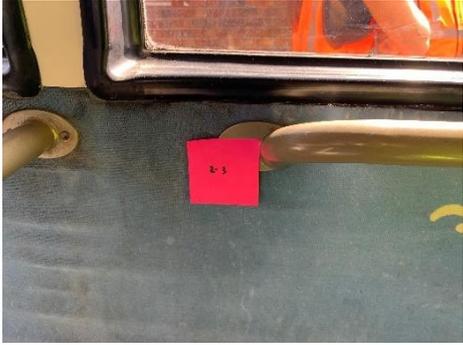
8. Appendix 1 – Sample Areas

8.1. Bus 1

Sample Point	Picture
1 – Hand Rail on Entry	
2 – Glass Divider	
3 – Hand Rail	
4 - Seat	

Sample Point	Picture
5 – Windowsill	
6 – Grab Handle	

8.2.   Bus 2

Sample Point	Picture
1 – Glass Divider	
2 – Grab Rail - Stairs	

3 – Carpeted Wall	
4 – Grab Rail	