



Your Laundry & Infection Control Partner

Addenbrookes

OTEX Microbiological Results & Site Survey

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1. INTRODUCTION

JLA's OTEX ozone disinfection system was introduced in February 2007 at Addenbrookes Hospital. The laundry consists of, four 16 kilo washing machines with two double OTEX ozone disinfection systems; this was installed to process mops (microfibre and traditional) and cloths.

Current laundry guidelines are recommended in HSG (95) 18. These guidelines were first introduced 30 years ago following research carried out in the 1960's. Whilst the guidelines are considered adequate for the disinfection of most vegetative bacteria, heat resistant spore forming organisms were not included in the original research by the Public Health Laboratory. Spore forming bacteria have been found to survive the laundering process at high wash temperatures¹. The OTEX system utilises the second most powerful disinfectant known, ozone, which is produced throughout the wash process providing full bacteriological protection. This allows laundry to be processed at lower temperatures resulting in benefits to both utility and textile life.

A visit was made to Addenbrookes on the 10th March 2008 to check the OTEX system and take samples for microbiological analysis. This report documents the finding of the site visit and the results of the microbiological analysis of samples taken.

2. WASH PROGRAM DETAILS

Program	OTEX	Thermal Disinfection
	Temp	Temp
Pre Wash	Cold	Warm 40°C
Main Wash	Cold	Hot 75°C
Rinse 1	Cold	Cold
Rinse 2	Cold	Cold
Rinse 3	Cold	Cold
Cycle Time	47 mins	1 hour

3. METHODOLOGY

3.1: Microfibre Mops & Cloths Analysis:

To investigate the effectiveness of the ozone wash process analysis of microfibre cloths and mops were carried out before and after washing. Individual microfibre cloths/mops were randomly selected and cut in half. One portion was retained as the pre sample. The other remaining half was processed with OTEX.

In addition bacteriological dipslides were used. Whilst it is appreciated that dipslides cannot be considered as an accurate measure of the level of pathogenic bacteria as accuracy is limited due to the sample size and the method of obtaining a result. However, dipslides have a significant benefit in that they are very convenient, simple to use and provide a result within a relatively short space of time. These should however only be considered as a process guide.

All samples were handled in an aseptic manner and analysed by an independent laboratory which is UKAS accredited, Microsearch Laboratories Ltd.

3.2: Surface & Air Analysis

Surface swabs and air samples inside the laundry were taken to establish the standard of cleanliness.

Air samples were carried out using Merck MAS-100 ECO air monitoring system. This is a simple method that accommodates standard petri dishes. The aspirated volume is 100 litres per minute, allowing 1000 litres of air collection per cycle. The sampling time was kept to less than 10 minutes to prevent dehydration of the agar surface. Yeasts and moulds, *Staphylococcus aureus* and Total Viable Count (TVC) were chosen as key indicators of bacterial contamination within the health care environment.

The swabs and air samples were analysed by UKAS Accredited Microsearch Laboratories Ltd.

4. BACTERIOLOGICAL TEST RESULTS.

Table 1: Pre/Post Analysis of Microfibre Cloths (Microsearch Laboratories Ltd):

Sample	State	Date	Colony Forming Units / ml (CFU/g)							
			TVC	Ecoli	Salmonella	S.aureus	C.diff	MRSA	Yeasts	Moulds
Blue cloth	Pre	11 03 2008	1.40E+08	4100	NEG	17400	190	12	7.40E+06	1.20E+04
Blue cloth	Post	11 03 2008	6.20E+01	< 1	NEG	< 1	< 1	< 1	< 1	< 1
Pink Cloth	Pre	11 03 2008	5.30E+10	2500	NEG	1100	2	<1	1.40E+02	3.70E+02
Pink Cloth	Post	11 03 2008	7.20E+04	< 1	NEG	< 1	< 1	< 1	310	96
Yellow Cloth	Pre	11 03 2008	9.30E+03	<1	NEG	< 1	< 1	< 1	56	12
Yellow Cloth	Post	11 03 2008	1.30E+02	< 1	NEG	< 1	< 1	< 1	< 1	< 1
Blue Cloth (Faded)	Pre	11 03 2008	8.20E+12	370	NEG	7800	103	194	3.80E+05	3800
Blue Cloth (Faded)	Post	11 03 2008	1.90E+02	< 1	NEG	< 1	< 1	< 1	< 1	< 1
Pink Cloth (Faded)	Pre	11 03 2008	3.00E+01	< 1	NEG	< 1	< 1	< 1	< 1	< 1
Pink Cloth (Faded)	Post	11 03 2008	4.00E+01	< 1	NEG	< 1	< 1	< 1	< 1	< 1
Mop	Pre	11 03 2008	7.10E+09	4.30E+04	NEG	41900	1300	740	TNTC	4.00E+04
Mop	Post	11 03 2008	2.20E+03	<1	NEG	2	< 1	< 1	80	2

< = Less than

NEG = Negative Result, Non detected

TVC = Total Viable Count (Includes pathogenic and non pathogenic strains)

Table 2: Surface Swabs Microbiological Results

Sample	Date	Colony Forming Units / ml (CFU/g)							
		TVC	Ecoli	Salmonella	S.aureus	C.diff	MRSA	Yeasts	Moulds
Pink Gloves	11 03 2008	3.80E+03	<1	NEG	45	<1	8	3	<1
Sink Taps	11 03 2008	4.60E+02	<1	NEG	13	<1	<1	<1	<1
Sorting Table	11 03 2008	9.00E+02	<1	NEG	<1	<1	<1	<1	<1
Dryer Handles	11 03 2008	3.80E+01	<1	NEG	9	<1	<1	<1	<1
Washer handles	11 03 2008	1.30E+03	<1	NEG	<1	<1	<1	<1	<1
Door Seal	11 03 2008	2.50E+03	<1	NEG	17	<1	<1	2	3

Table 3: Air Samples Microbiological Results

Sample	Date	Colony Forming Units / litre (CFU/Litre)				
		TVC	S.aureus	MRSA	Yeasts	Moulds
Floor near clean cloths	13 02 2008	9.20E+01	3	<1	3	36
Above washers	13 02 2008	TNTC	<1	5	158	370
Mop Storage	13 02 2008	2.90E+02	42	11	78	279
Outside Laundry	13 02 2008	8.00E+01	2	<1	14	58

Table 4: TVC Pre/Post Results (Dipslides)

Item	TVC (CFU/cm) Before OTEX	TVC (CFU/cm) After OTEX
Microfibre Cloths	NG	NG
	MG	MG
	VSG	NG
	NG	NG
Microfibre Mops	SG	NG
	SG	NG
	SG	NG
	SG	NG

TVC Total Viable Count
VSG Very Slight Growth

NG No Growth
SG Slight Growth

5. OBSERVATIONS

During the site visit a number of area's were highlighted and reported back to the customer as per the below:

- The area around the oxygen generators was untidy and cluttered resulting in restricted airflow around the units, the storage of a vacuum cleaner in front of the unit did not assist in this. . Both units had been pushed together, again restricting the airflow. It is vital that the oxygen generators have a good flow of air supply so that a sufficient amount of oxygen can be produced for the OTEX system.
- The filters on both oxygen and ozone generators were found to be extremely dirty. It is vital that these filters are regularly checked. Blocked filters can again result in the units having restricted airflow and overheating. This could have an adverse effect on the level of ozone being produced. The units have been clearly labelled to remind staff that they should be cleaned regularly. Upon the site visit staff operating the laundry were again made aware of their obligation to carry out these checks and keep the area free of any obstructions.
- Washer No 3 was found to be leaking, this had not been reported by site.

- The same washing machine failed an OTEX cycle; staff using the machines were unaware of what to do when this happened, identifying training issues.
- Whilst there are visible instructions asking staff to use “pink gloves for handling dirty laundry and blue gloves for clean”, only one pair of pink gloves was observed in use.
- No hand washing was observed for any of the staff working in the laundry or those depositing dirty laundry at the time of the site visit.
- No soap appeared to be available. Only washing up liquid or what appeared to be Flash purpose.
- The hot water supply was extremely hot, making it unbearable to adequately wash hands. The temperature needs to be reduced either locally with a thermostat valve or provision of a mixer tap should be considered.
- The hand-washing sink within the laundry was being used to drain mop buckets. This resulted in the spent fluid being spilled in the area where the clean microfibre cloths were being stored on the floor.
- Clean laundry stored on the floor.
- Mixed loads – microfibre cloths and mops plus traditional mops were being washed together.
- Overloading of the machines.
- Training needs to be reviewed.
- Some kitchen items ie oven gloves, were being laundered within the machines on a microfibre wash programme this is unsuitable for such items.
- Storage of clean mops/disposable items close to OTEX equipment and dirty laundry. There is a vacant area to the left of the laundry, which would be more suitable for storage.

6. CONCLUSION

The results of the independent analysis have demonstrated that OTEX has achieved effective disinfection of the microfibre cloths and mops. Whilst *C.difficile* was found in the items prior to laundering no clostridium species was identified in any of the post wash samples. The swabs and air samples indicate that the laundry area could be a source of recontamination and consideration should be given to addressing the issues raised in the previous section of this report.

8. REFERENCES

1. J.A.Wilson, H.P.Loveday, P.N.Hoffman, R.J.Pratt. Uniform: an evidence review of the microbiological significance of uniforms and uniform policy in the prevention and control of healthcare-associated infections. Report to the Department of Health (England). *J Hosp Infect* (2007) **66**, 301-307

Appendix A:
Addenbrookes Site
Photographs.

Addenbrookes Medirest Laundry Photographs.
Site Visit 10th March 2008.



Clean Microfibre Cloths stored on floor in traffic lane of laundry



Leaking washer not reported



Filters not cleaned



Obstruction of oxygen generator.



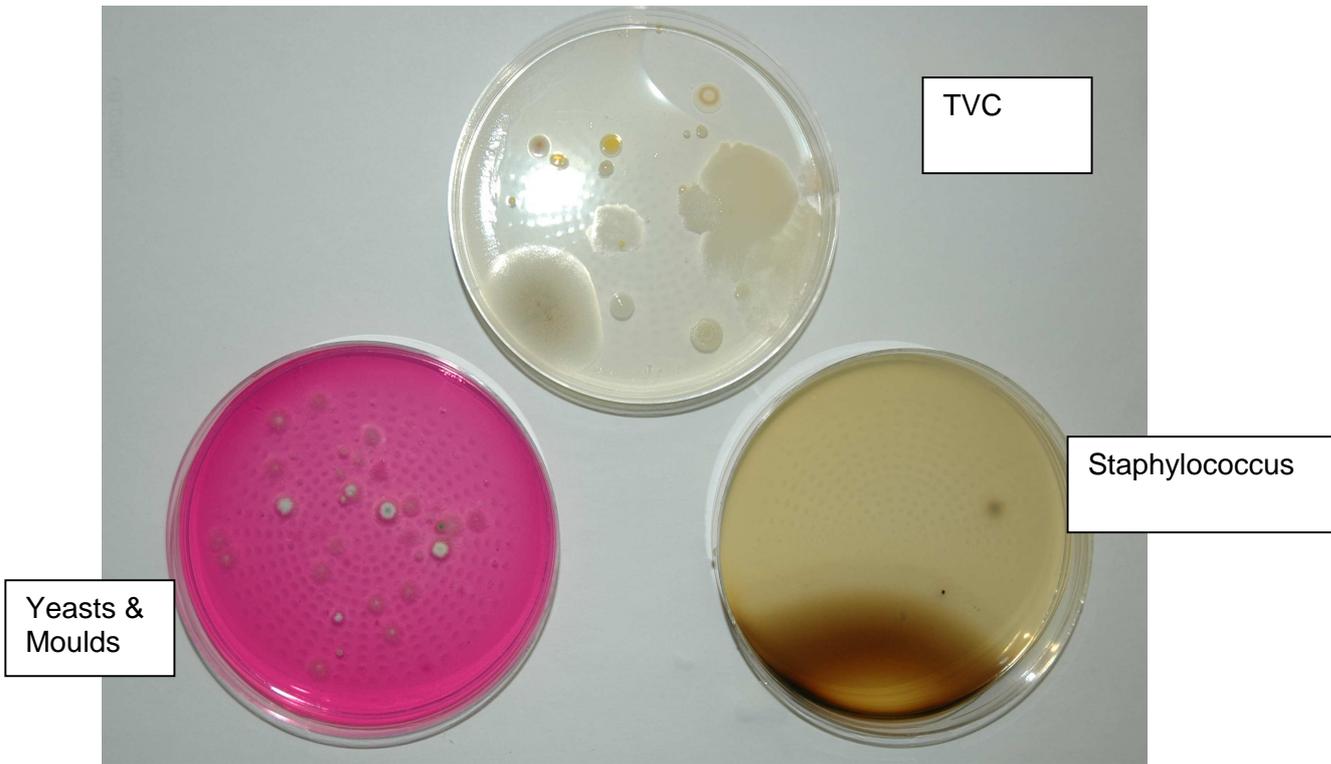
Hand washing facilities



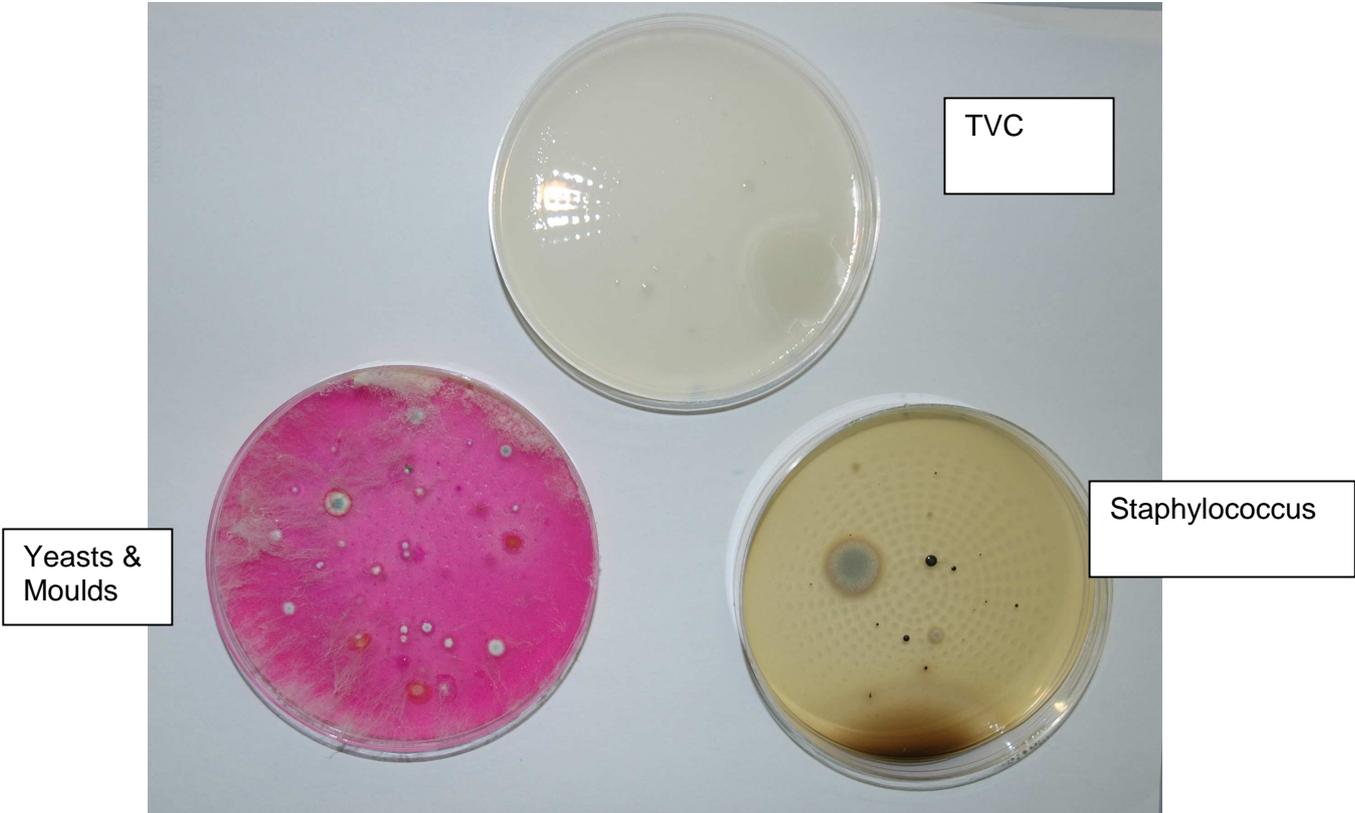
Mixed wash loads



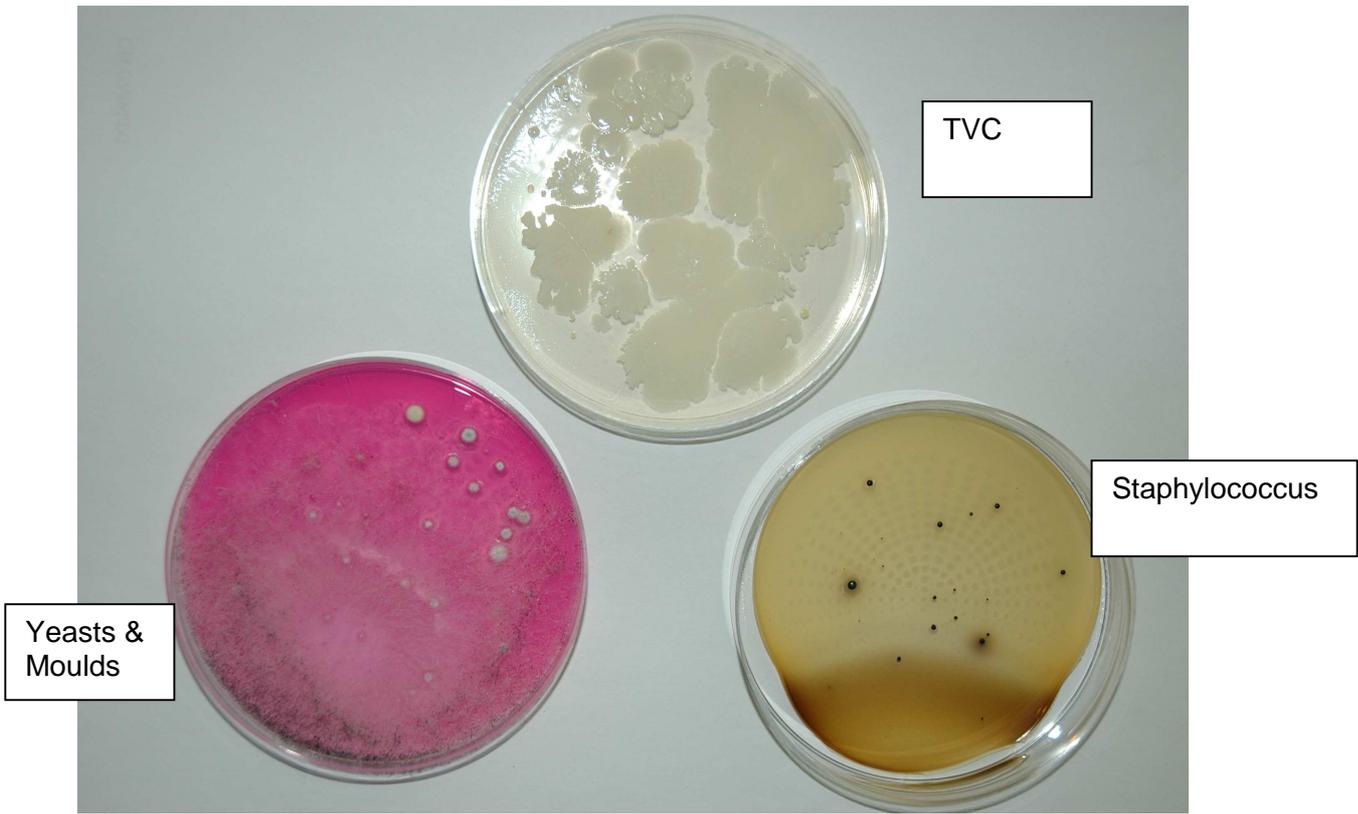
Appendix B:
Air Sample
Photographs



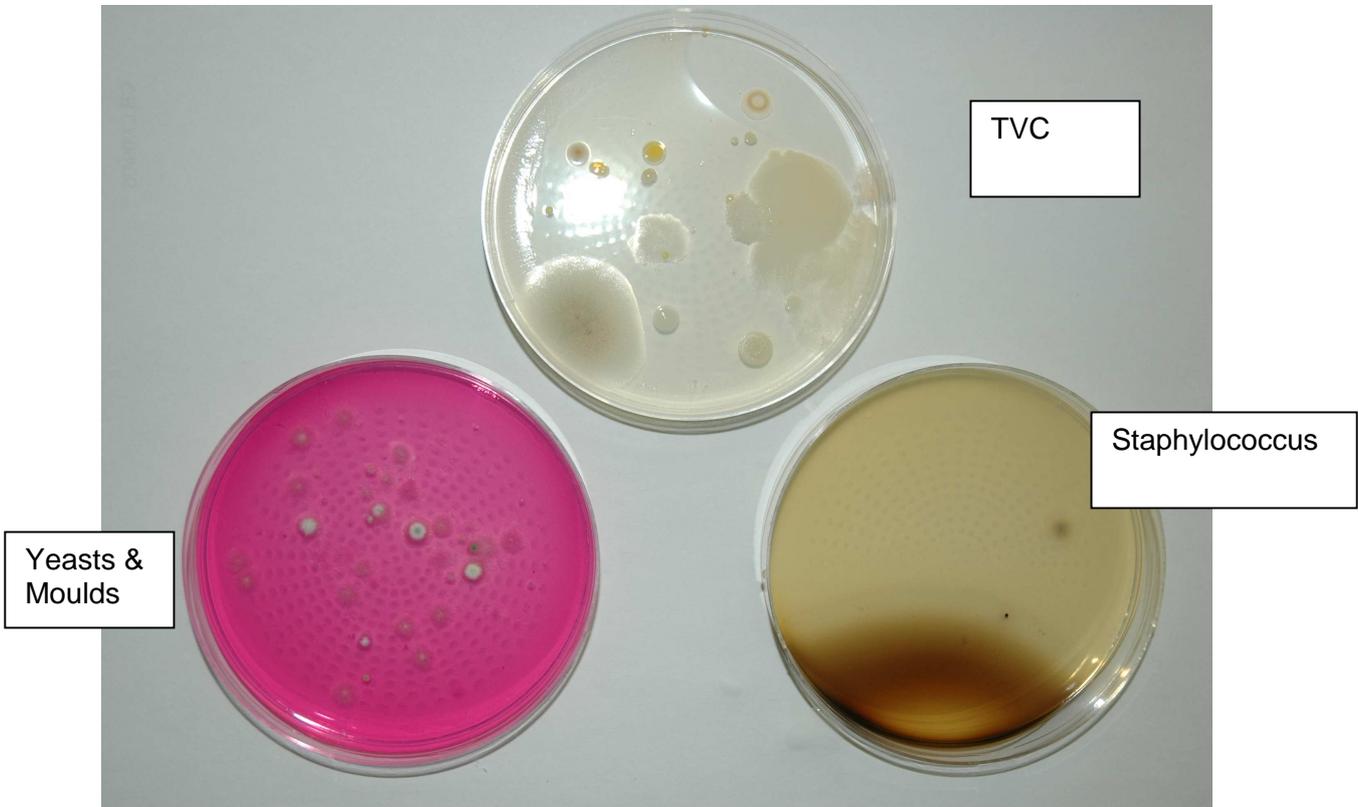
Set 1: Floor area near stored clean cloths.



Set 2: Above Washers



Set 3: Clean Mop Storage Area



Set 4: Area outside laundry

