



Your Laundry & Infection Control Partner

# Ozone As An Alternative To Thermal Disinfection

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# Ozone History

- Discovered in 1880s by a Dutch professor called Van Marum
- First technical application was the purification of drinking water in 1893 in Holland
- Common uses : Swimming pools, Water purification, Food Disinfection, Smoke damage reclamation, Laundry, Air purification and even Blood purification

# Ozone ?

## Where does it come from?

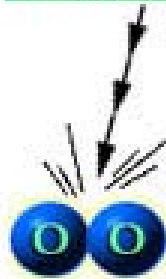
- A pale blue gas naturally present in the stratosphere where it shields the earth from harmful UV radiation , this is good ozone
- Ozone is also created at low level in the troposphere by car emissions, industry etc, this is bad ozone
- Ozone created artificially is considered pure ozone as it does not contain the harmful properties that create ozone in the troposphere. Sometimes referred to as “ozone activated oxygen”

# Ozone Properties

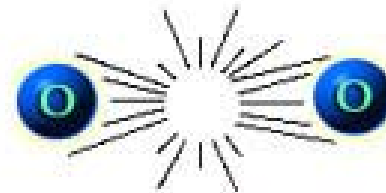
- The second strongest oxidiser next to fluorine
- Works 3,500 times faster than chlorine
- Ozone destroys the cell wall of the bacteria
- Oxidises bacteria and viruses including Clostridium Difficile and MRSA
- Reverts to oxygen
- Manufactured as required no need to store chemicals

# Natural Ozone Creation

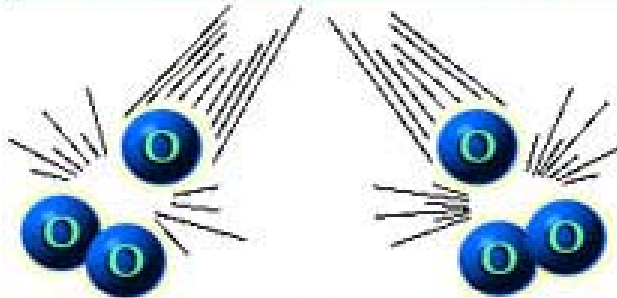
## OZONE PRODUCTION IN THE STRATOSPHERE



"High-energy" ultraviolet radiation strikes an oxygen molecule. . .



. . .and causes it to split into two free oxygen atoms.



The free oxygen atoms collide with molecules of oxygen. . .



. . .to form ozone molecules.

# Manufacturing Ozone

- Oxygen gas 90% concentration
- Subjected high voltage electricity
- Simulating a lightning storm

# Utilising the Properties of Ozone in Laundry

## **Bacteria Oxidisation**

Kills bacteria on any cycle

## **Low Water Temperatures –**

Ozone is most effective in cold water,

Breakdown of Soiling

Oxidisation of soiling and bacteria

Less fabric damage

## **Reduced Water Consumption –**

Ozone's searching nature

Utilising mechanical action

**Inherent belief that everything washed,  
no matter what cycle, comes out clean**

So Why Ozone ?

Easier to stick with thermal ?

Go along with HSG 95 (18) ?

Stick to selling Washing Machines ?

# **Initially developed to replace all lower temperature cycles apart from thermal disinfection**

Testing showed ozone destroyed C.diff spores which are not killed by thermal disinfection at 71 deg

# **E.C.H.O. Remote Laundry Management**

**2 x 90 bed nursing homes with  
85% incontinence monitored for 3 months**

**Out of over 3,600 washes only 8 were  
thermal disinfection cycles**

## **WHY?**

# WHY?

- Ignorance of implications
- Pressure to process the work
- 40°C fast wash takes 40 minutes
- Thermal disinfection cycle takes 85 minutes

# Problems

- Initial research was carried out in 1969 prior to the dramatic increase in so-called superbugs
- Independent testing shows that thermal disinfection is failing on at least 30% of loads
- Spore forming bacteria such as Clostridium Difficile are not destroyed at 71°C
- Heavily relies on operatives choosing the right cycle for soiling/infection

# THE FAMOUS 40°C WASH!

Garment Labelling

Media Advertising

Energy Costs

Faster Wash Cycles

A MORI Poll commissioned in 2003 showed that  
almost

HALF of nurses washed their uniforms  
at home in 40°C wash cycle

# MRSA Contamination of Nurses Uniforms

Control Membrane



40° C Wash Membrane

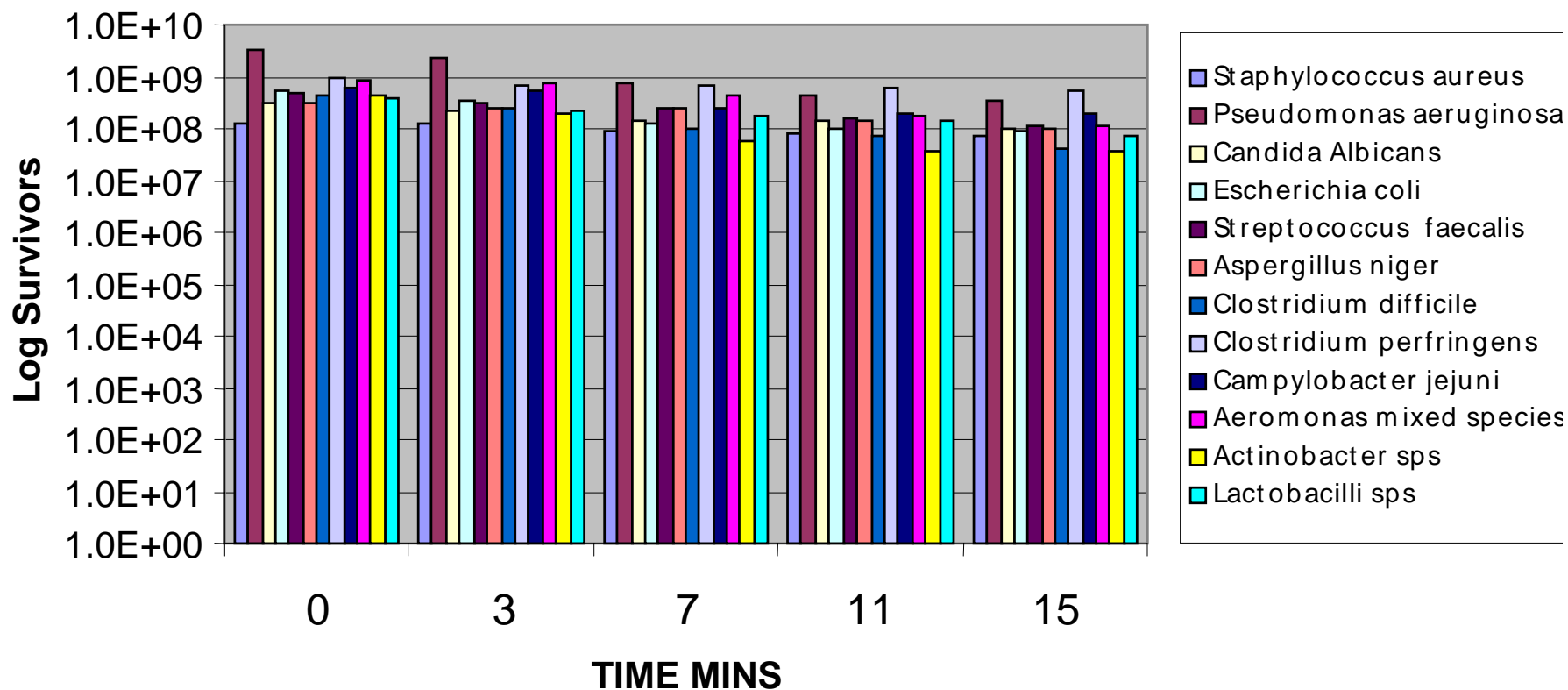


OTEX Membrane

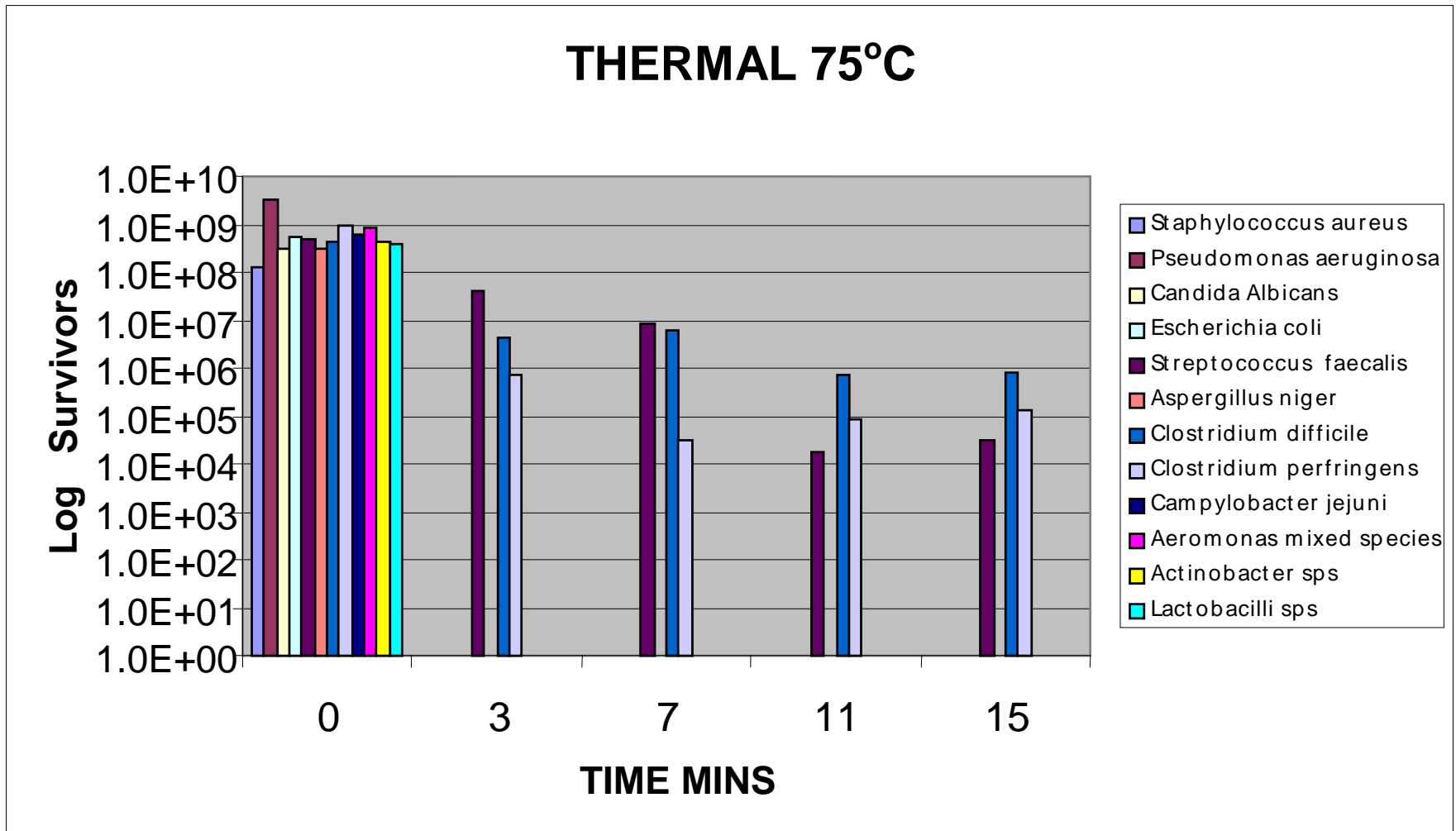


# List of bacteria and viruses tested

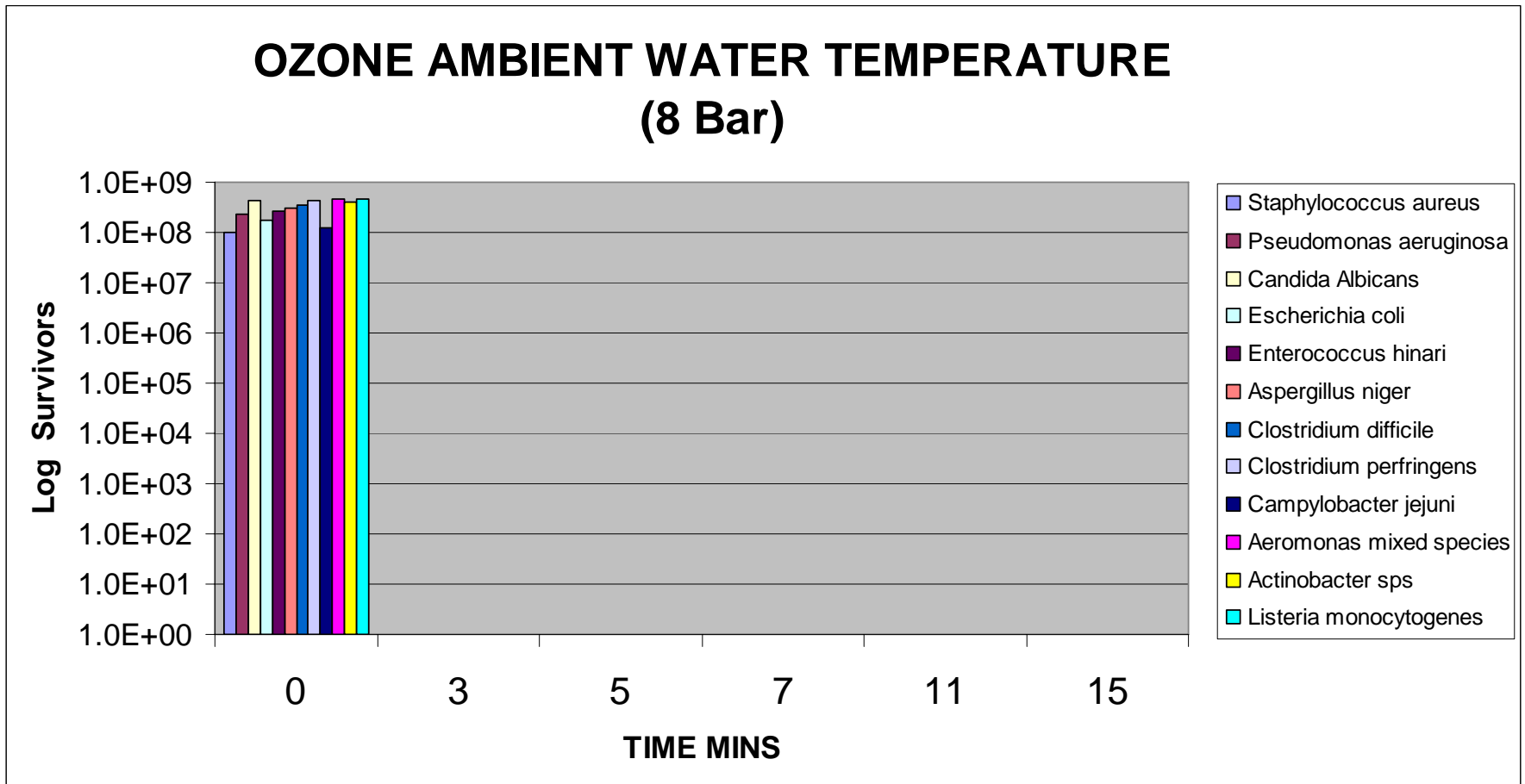
## CONTROL AMBIENT – No Ozone



# List of bacteria and viruses tested at 75 deg



# List of bacteria and viruses tested in Ozone



# 6 month trial at QE11 East & North Herts NHS Trust

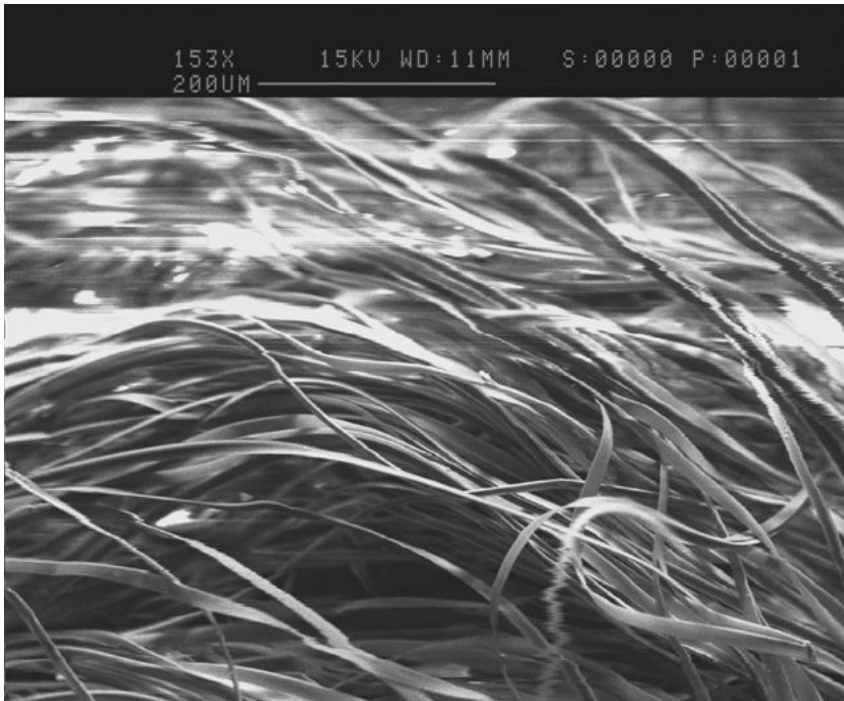
- Both traditional and microfibre mops
- Samples taken and analysed by microbiologists
- Over 150,000 C.diff colonies remained after thermal
- Over the course of the trial no target organisms could be recovered following ozone processing
- **Hospital have now adopted OTEX in preference to thermal disinfection**

Location	Sample – Thermal Disinfection 75°c	Date	TVC	Yeasts	Moulds	S.aureus	MRSA	C.diff
North West	Chefs Uniform Post Thermal T/Dry (Post 48hrs)	23 02 2007	3.9E+02	<1	<1	<1	<1	<1
North West	Chefs Uniform Post Thermal T/Dry	23 02 2007	6.0E+01	<1	<1	<1	<1	3.0E+00
North West	Chefs Uniform Pre Thermal	23 02 2007	9.3E+05	2.7E+03	5.0E+01	1.5E+03	7.0E+00	2.0E+00
North West	Microfibre Mop Post Thermal	23 02 2007	1.8E+03	<1	<1	<1	<1	7.6E+01
North West	Microfibre Cloth Post Thermal	23 02 2007	7.0E+02	<1	<1	<1	<1	4.0E+00
North West	Microfibre Cloth Post Thermal	23 02 2007	4.6E+02	<1	<1	<1	<1	<1
North West	Microfibre Mop Post Thermal	23 02 2007	2.1E+03	<1	<1	<1	<1	2.5E+01
North West	Microfibre Cloth Post Thermal	23 02 2007	1.1E+03	<1	<1	<1	<1	3.0E+01
North West	Microfibre Cloth (Red) Post Thermal T/Dry (Post 48hrs)	23 02 2007	4.8E+03	<1	<1	<1	<1	3.0E+00
North West	Microfibre Cloth (Blue) Post Thermal T/Dry (Post 48hrs)	23 02 2007	1.9E+02	<1	<1	<1	<1	<1
North West	Microfibre Cloth (Red) Post Thermal T/Dry	23 02 2007	7.6E+02	<1	<1	<1	<1	1.9E+01
North West	Microfibre Cloth (Blue) Post Thermal T/Dry	23 02 2007	5.4E+02	<1	<1	<1	<1	<1
North West	Microfibre Cloth (Blue) Post Thermal T/Dry	23 02 2007	7.4E+01	<1	<1	<1	<1	5.0E+00
North West	Microfibre Mop Post Thermal T/Dry	23 02 2007	5.6E+02	<1	<1	<1	<1	7.0E+00
North West	Microfibre Mop Post Thermal T/Dry	23 02 2007	1.9E+02	<1	<1	<1	<1	2.6E+01
North West	Cotton Mop Pre Thermal	23 02 2007	>1.0e10	3.2E+05	2.7E+04	>1.0e6	2.1E+03	2.1E+03
North West	Microfibre Mop Pre Thermal	23 02 2007	>1.0e10	1.3E+05	5.1E+04	>1.0e6	4.1E+03	9.3E+04
North West	Pre Thermal Microfibre Cloth (Blue)	23 02 2007	>1.0e10	2.8E+06	8.2E+05	>1.0e6	1.8E+04	1.9E+02
North West	Pre Thermal Microfibre Cloth (Red)	23 02 2007	>1.0e10	1.3E+07	8.4E+04	3.1E+04	9.0E+01	3.3E+02
North West	24hrs Pre Thermal Microfibre Mop	23 02 2007	>1.0e10	5.0E+06	7.1E+03	>1.0e6	1.7E+04	1.7E+04
North West	24hrs Pre Thermal Microfibre Cloth (Red)	23 02 2007	>1.0e10	2.4E+06	2.6E+04	>1.0e6	3.1E+02	7.1E+02

Location	Sample – OTEX	Date	TVC	Yeasts	Moulds	S. Aureus	MRSA	C-diff
Nottinghamshire	Pre OTEX Microfibre Mop	20-Oct-06	3.00E+09	9.10E+04	230	780	81	3
Nottinghamshire	Pre OTEX Microfibre Cloth	20-Oct-06	2.90E+04	5.60E+04	1900	450	32	<1
Nottinghamshire	Pre OTEX Cotton Mop	20-Oct-06	5.40E+09	3.90E+04	4.30E+03	1100	19	4
Nottinghamshire	Post OTEX Cotton Mop	20-Oct-06	42	<1	<1	<1	<1	<1
Nottinghamshire	Post OTEX Microfibre Mop	20-Oct-06	78	<1	<1	<1	<1	<1
Nottinghamshire	Post OTEX Apron	20-Oct-06	23	<1	<1	<1	<1	<1
North West	Pre OTEX Microfibre Cloth	25-Oct-06	9.30E+12	TNTC	TNTC	7.50E+10	> 1.0e6	1.40E+08
North West	Pre OTEX Microfibre Mop	25-Oct-06	7.40E+14	TNTC	TNTC	TNTC	> 1.0e6	2.10E+08
North West	Post OTEX Cotton Mop	25-Oct-06	7800	30	50	<1	<1	<1
North West	Pre OTEX Cotton mop	25-Oct-06	4.60E+12	TNTC	TNTC	TNTC	> 1.0e6	7800
North West	Pre OTEX Microfibre Mop	25-Oct-06	9.20E+12	TNTC	TNTC	TNTC	9.20E+05	6.00E+07
North West	Pre OTEX Microfibre Cloth	25-Oct-06	TNTC	TNTC	TNTC	TNTC	6.30E+06	2.10E+05
North West	Post OTEX Microfibre Mop	25-Oct-06	4100	<1	<1	<1	<1	9
North West	Post OTEX Microfibre Mop	25-Oct-06	800	<1	<1	<1	<1	<1
North West	Post OTEX Microfibre Cloth	25-Oct-06	9700	<1	<1	<1	<1	<1
North West	Pre OTEX Microfibre Cloth	8-Nov-06	1.3E+05	3.6E+03	3.4E+02	9.8E+02	1.4E+01	<1
North West	Post OTEX Microfibre Mop	8-Nov-06	2.3E+01	<1	<1	<1	<1	<1
North West	New Disposable	8-Nov-06	1.8E+02	<1	<1	<1	<1	<1
North West	Dirty Disposable Red Cloth	8-Nov-06	3.1E+08	2.6E+04	1.9E+04	7.1E+05	4.5E+01	7.0E+00
North West	Dirty Disposable Blue Cloth	8-Nov-06	7.0E+05	5.1E+03	1.3E+02	2.3E+04	1.8E+01	<1
North West	Pre OTEX Cotton Mop	8-Nov-06	7.1E+08	2.0E+06	7.1E+04	8.2E+04	1.8E+02	1.8E+01
North West	Post OTEX Microfibre Cloth	8-Nov-06	6.2E+01	<1	<1	<1	<1	<1
North West	Post OTEX Cotton Mop	8-Nov-06	1.7E+01	<1	<1	<1	<1	<1
North West	Pre OTEX Microfibre Mop	8-Nov-06	2.1E+06	1.7E+04	3.0E+02	2.1E+04	5.1E+02	<1

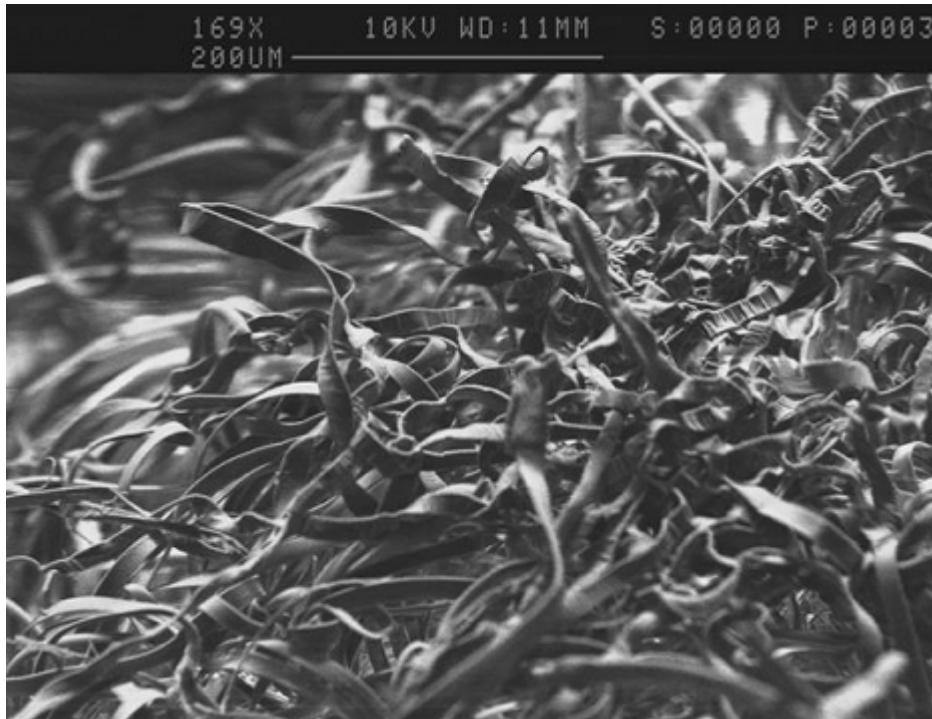
# Fibre Damage

## Untreated Fibres



# Fibre Damage

After Thermal



After OTEX



# The Use of Ozone in Your Laundry

Conforms to HSE

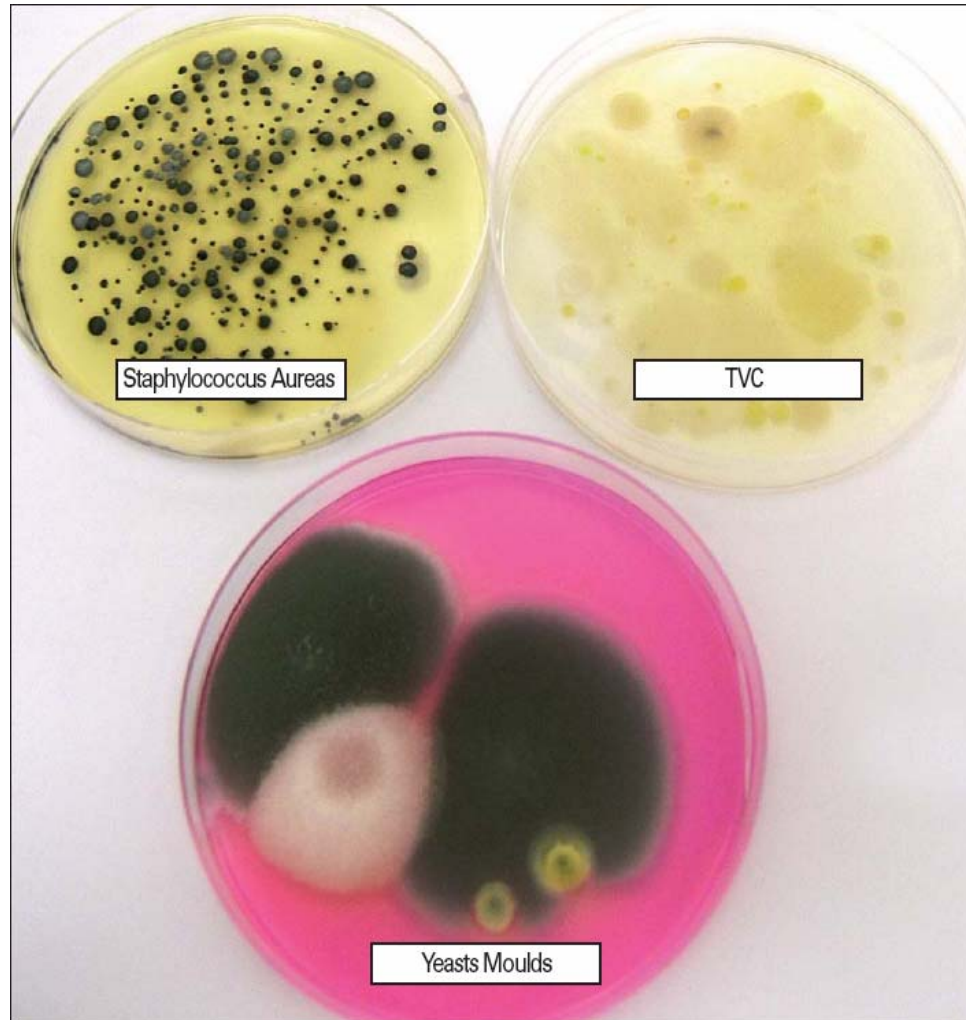
No Storage required

No Staff handling

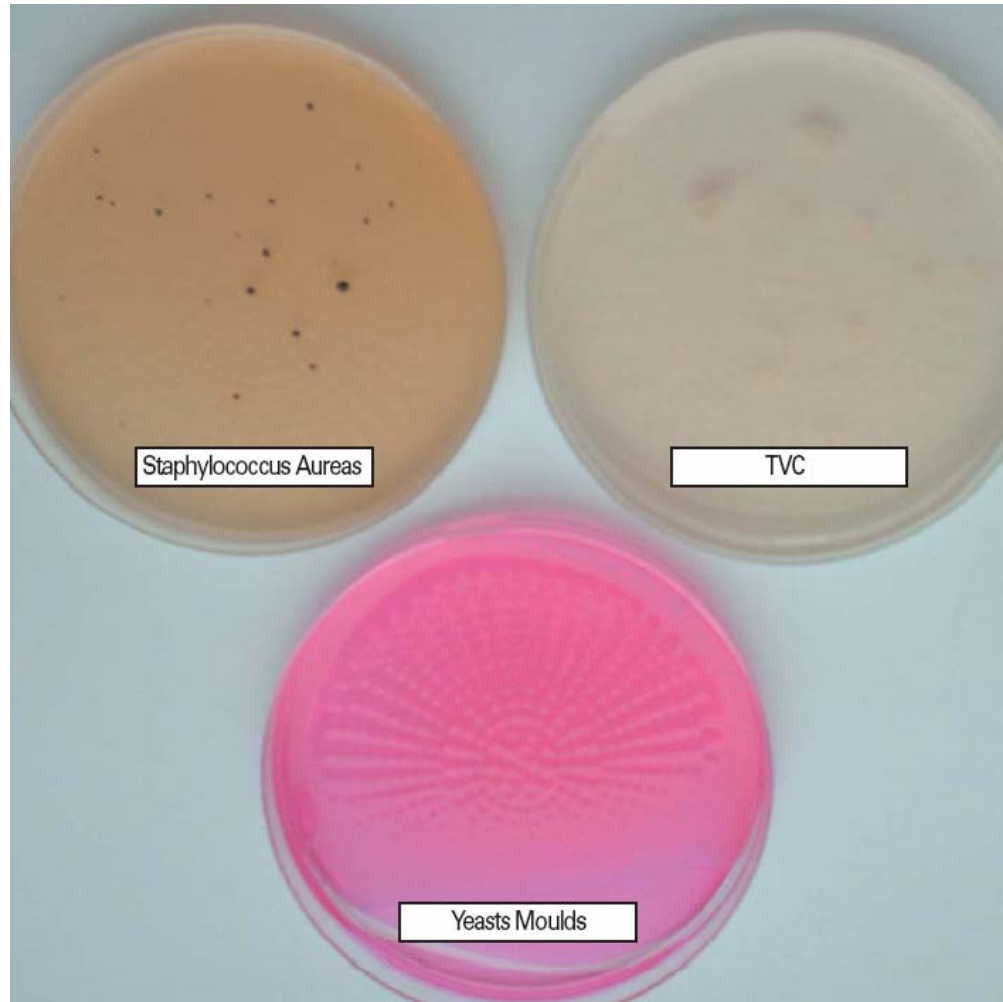
Minimal Operating Costs – 75p per day

Air samples taken in hospital laundry rooms showed dramatic reduction in airborne bacteria including MRSA

# AIR SAMPLING - BEFORE



# AIR SAMPLING - AFTER



# Ozone - What are the Benefits?

Utilities - *“Opportunity to Reduce Washer Extractor  
Cycle Costs by 50% and Achieve Disinfection”*

Bacteria- *Kills bacteria, viruses and superbugs on all  
programmes*

Wash Quality – *Achieving Industry Standards*

Environmental- *Reduced Carbon Footprint*