



# Airandé

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## Efficacy Data for Airandé Disinfection System in Healthcare-related Settings July 2019

Dr Belinda Chapman, PhD, BSc (Hons), Grad. Dip. Science Management  
Principal Scientific Adviser, Airandé



# Scope of data



- 
- Target applications: hospital rooms and surfaces found in hospital rooms and public spaces in hospitals
  - Target organisms: bacterial vegetative cells, bacterial sporeformers, yeasts and moulds
  - Studies: challenge studies and field studies

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## H<sub>2</sub>O<sub>2</sub> Efficacy Data



# Challenge study 1: inactivation of various bacteria by liquid H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: liquid H<sub>2</sub>O<sub>2</sub>, 3% concentration
- Study details: five different surface types (wood, glass, laminate, stainless steel, vinyl) artificially contaminated with four different types of microbes (*Escherichia coli*, *Candida albicans*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, exposed to disinfection and samples collected by swabbing for plating
- Results:

Sample	Surfaces	Inoculum count (cfu / mL)	Count after disinfection	Log reduction
<i>E. coli</i>	all	3x10 <sup>8</sup>	<10	~7
<i>C. albicans</i>	all	3x10 <sup>8</sup>	<10	~7
<i>P. aeruginosa</i>	all	3x10 <sup>8</sup>	<10	>7
<i>S. aureus</i>	all	3x10 <sup>8</sup>	<10	~7



# Field study 1: microbial burden reduction on various surfaces room using liquid H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: liquid H<sub>2</sub>O<sub>2</sub>, 3% concentration with 1 minute contact time
- Study details: samples obtained by contact plating, before and after disinfection, from customer desk, automatic cash machine, information desk and sink in ladies' bathroom

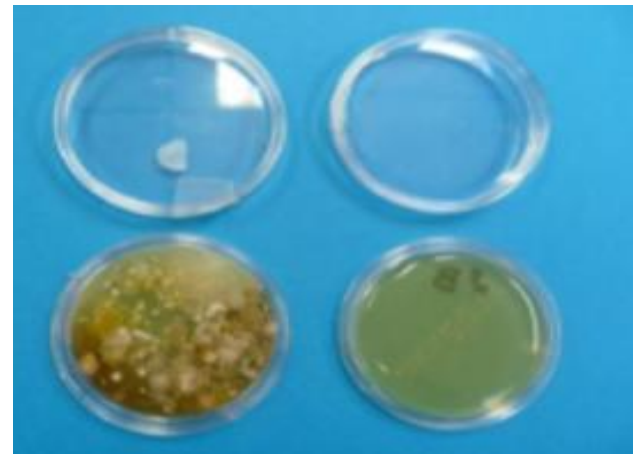
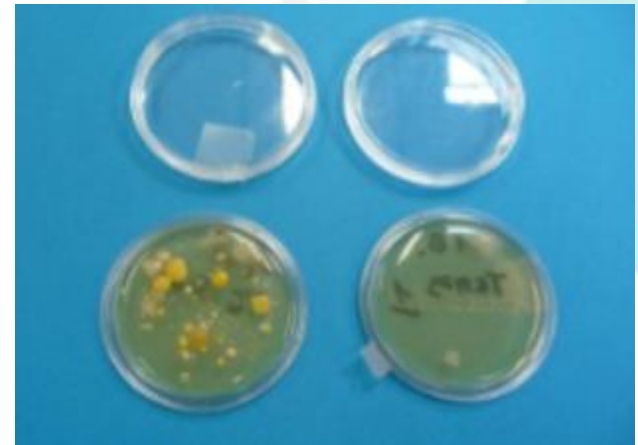


# Field study 1: microbial burden reduction on various surfaces using liquid H<sub>2</sub>O<sub>2</sub>

- Results:

Customer desk	Count (cfu / mL)	Log reduction
Before (T0)	~10 <sup>2</sup>	N/A
After liquid (T1)	10	~1

Cash machine	Count (cfu / mL)	Log reduction
Before (T0)	~10 <sup>3</sup>	N/A
After liquid (T1)	<10	>2

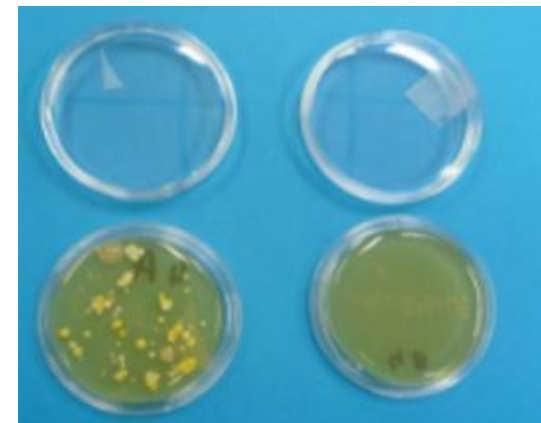
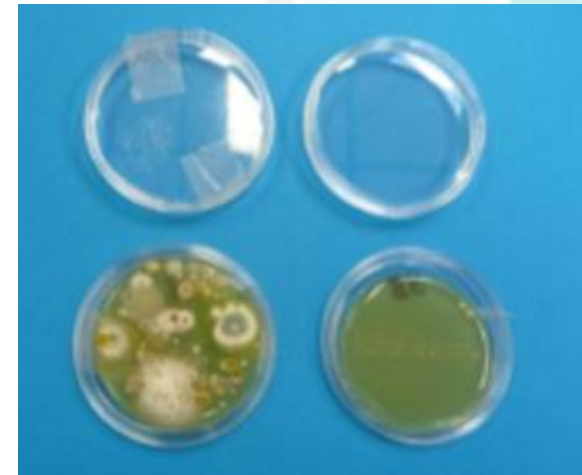


# Field study 1: microbial burden reduction on various surfaces using liquid H<sub>2</sub>O<sub>2</sub>

- Results:

Information desk	Count (cfu / mL)	Log reduction
Before (T0)	~10 <sup>2</sup>	N/A
After liquid (T1)	20	~1

Bathroom sink	Count (cfu / mL)	Log reduction
Before (T0)	~10 <sup>2</sup>	N/A
After liquid (T1)	<10	>1



# Challenge study 2: inactivation of *Clostridium difficile* by vapourised H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: vapourised H<sub>2</sub>O<sub>2</sub>, 7% concentration, 50m<sup>3</sup> programmed volume
- Study details: petri dishes pre-prepared with spores of *Clostridium difficile* and placed at 3 locations in a hospital room, exposed to disinfection program and closed 1 h after program completion
- Results:

Sample	Location	Count (cfu / mL)	Log reduction
Control	Un-exposed	4x10 <sup>7</sup>	N/A
Location A	3 m away & 40 cm above	1.5x10 <sup>3</sup>	~4
Location B	4 m away at ground level	<10	>6
Location C	80 cm above to side	4.5x10 <sup>2</sup>	~5





# Field study 2: reduction of microbial burden in hospital room using vapourised H<sub>2</sub>O<sub>2</sub>

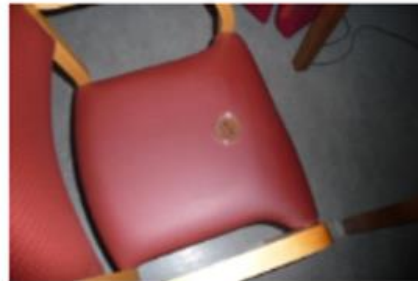
- Disinfection technology: vapourised H<sub>2</sub>O<sub>2</sub>, 7% concentration, 35m<sup>3</sup> (6 mL/m<sup>3</sup>) programmed volume
- Study details: exposure plates collected before and after disinfection from bathroom sink
- Results:

Sample	Count (cfu / mL)	Log reduction
Before	~10 <sup>3</sup>	N/A
After	<10	~2



# Field study 3: microbial burden reduction in hospital room using liquid and vapourised H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: liquid H<sub>2</sub>O<sub>2</sub>, 3% concentration with 10 second contact time, followed by vapourised H<sub>2</sub>O<sub>2</sub>, 7% concentration, 35m<sup>3</sup> (6 mL/m<sup>3</sup>) programmed volume
- Study details: samples obtained by contact plating, before and after each stage of disinfection, from night stand, chair and toilet

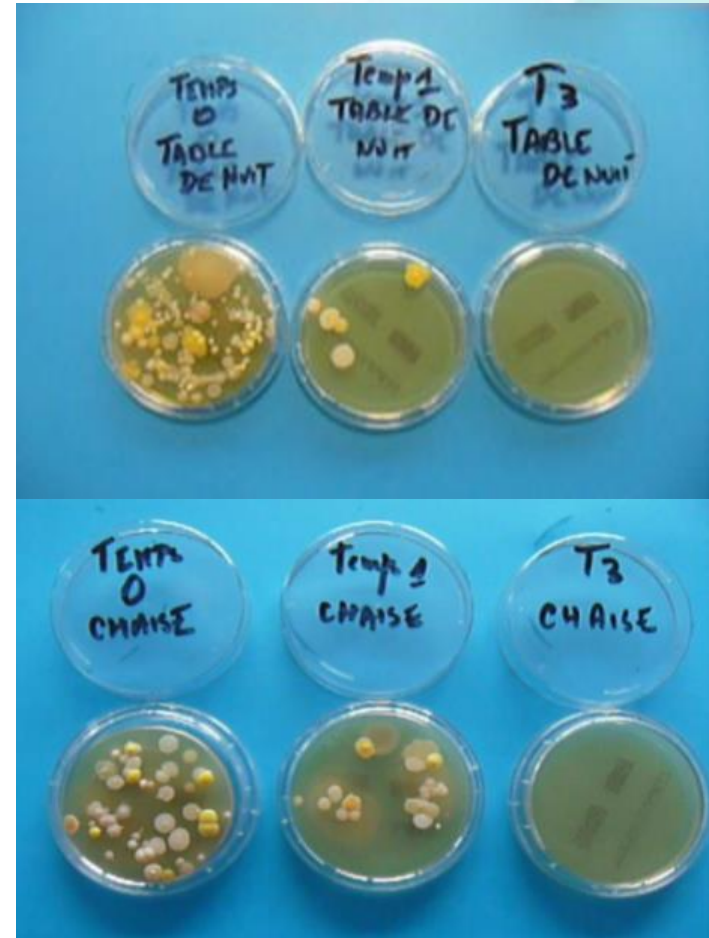


# Field study 3: microbial burden reduction in hospital room using liquid and vapourised H<sub>2</sub>O<sub>2</sub>

- Results:

Night stand	Count (cfu / mL)	Log reduction
Before (T0)	~10 <sup>3</sup>	N/A
After liquid (T1)	50	~2
After vapour (T3)	<10	~3

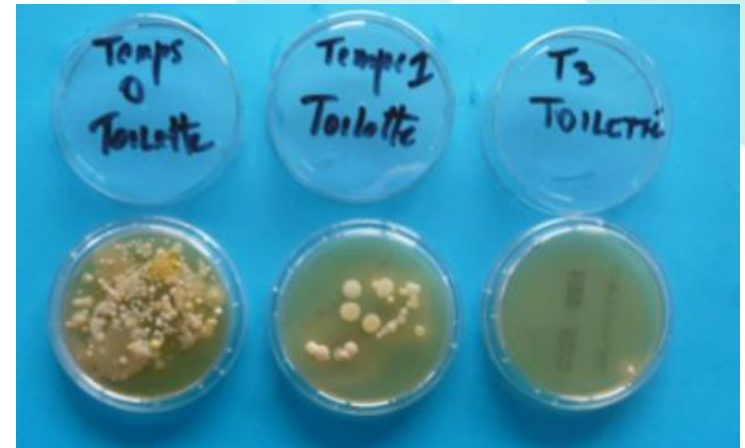
Chair	Count (cfu / mL)	Log reduction
Before (T0)	5 x 10 <sup>2</sup>	N/A
After liquid (T1)	2 x 10 <sup>2</sup>	<1
After vapour (T3)	<10	~2



# Field study 3: microbial burden reduction in hospital room using liquid and vapourised H<sub>2</sub>O<sub>2</sub>

- Results (continued):

Toilet	Count (cfu / mL)	Log reduction
Before (T0)	$\sim 1 \times 10^4$	N/A
After liquid (T1)	$2 \times 10^2$	$\sim 2$
After vapour (T3)	$<10$	$\sim 3$



# Challenge study 3: MRSA and VRE in hospital room using vapourised H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: vapourised H<sub>2</sub>O<sub>2</sub>, 6% concentration in 80m<sup>3</sup> hospital room for 18 minutes
- Study details: 22 room surfaces (including bed, bedside rail, blood pressure cuff, intravenous pump, call button, dresser, door handle, toilet, toilet rail, curtain rail) artificially contaminated with methicillin resistant *Staphylococcus aureus* and vancomycin resistant enterococci, then routine cleaning and sanitising applied, followed by vapourised H<sub>2</sub>O<sub>2</sub> disinfection, with swabs taken for plating

• Results:

Sample	No. detections MRSA (/22 surfaces)	No. detections VRE (/22 surfaces)
Before cleaning	22	22
After cleaning	9	13
After disinfection	7	4

**An evaluation of nebulised hydrogen peroxide post routine cleaning for environmental surface disinfection**

J. Kok\*, L. Thomas, J. Tallon, K. Dempsey, G. Gilbert (Westmead, AU)

# Field study 4: Microbial burden in hospital ward using vapourised H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: vapourised H<sub>2</sub>O<sub>2</sub>, 6% concentration in 80m<sup>3</sup> hospital room for 18 minutes
- Study details: 300-bed teaching hospital with one- and two-bedded rooms with *en suite*, manually cleaned as usual before disinfection applied, contact plates (toilet flush button, bedside table, handset, IMED pump, keyboard, ECG contact leads) – 4 rooms x 4 surfaces x 3 time points (patient discharge, after cleaning, after disinfection)



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Evaluation of the biological efficacy of hydrogen peroxide vapour decontamination in wards of an Australian hospital

H.-T. Chan, P. White, H. Sheorey, J. Cocks, M.-J. Waters\*

*Departments of Microbiology and Infection Control, St Vincent's Hospital, Melbourne, Australia*

# Field study 4: Microbial burden in hospital ward using vapourised H<sub>2</sub>O<sub>2</sub>

- Results:

Area (no. sampled)	Post patient discharge (average cfu/plate)	Post cleaning (average cfu/plate)	Post H <sub>2</sub> O <sub>2</sub> (average cfu/plate)
Call bell (3)	33	28	2
Cotside (4)	84	25	3
Bedside table (3)	19	276	<1
Toilet button (3)	80	45	1
IMED pump (2)	26	41	8
ECG leads ICU (1)	793	531	3
Keyboard ICU (1)	22	11	0

# Challenge study 4: VRE on various hospital surfaces using vapourised H<sub>2</sub>O<sub>2</sub>

- Disinfection technology: vapourised H<sub>2</sub>O<sub>2</sub>, 6% concentration
- Study details: 5 surfaces commonly encountered in the hospital environment (stainless steel, vinyl, Laminex®, Tarkett®, glass) artificially contaminated with vancomycin resistant enterococci, and placed on a table in a patient room for vapourised H<sub>2</sub>O<sub>2</sub> disinfection, then remaining viable organisms recovered by contact plating



Evaluation of the biological efficacy of hydrogen peroxide vapour decontamination in wards of an Australian hospital

H.-T. Chan, P. White, H. Sheorey, J. Cocks, M.-J. Waters\*

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# Challenge study 4: VRE on various hospital surfaces using vapourised H<sub>2</sub>O<sub>2</sub>

- Results:

Surface	Untreated (cfu)	H <sub>2</sub> O <sub>2</sub> (cfu)
Steel 1	>1150	0
Steel 2	>531	50
Steel 3	>1214	0
Steel 4	>617	1
Steel 5	>504	7
Steel 6	>2028	16

Surface	Untreated (cfu)	H <sub>2</sub> O <sub>2</sub> (cfu)
Laminex® 1	>448	22
Laminex® 2	>1323	236
Laminex® 3	>1505	19
Laminex® 4	>799	0
Laminex® 5	>1124	24
Laminex® 6	>1700	111

# Challenge study 4: VRE on various hospital surfaces using vapourised H<sub>2</sub>O<sub>2</sub>

- Results:

Surface	Untreated (cfu)	H <sub>2</sub> O <sub>2</sub> (cfu)
Glass 1	220	0
Glass 1	183	1
Glass 1	>561	2
Glass 1	>219	6
Glass 1	24	0
Glass 1	>1600	108

Surface	Untreated (cfu)	H <sub>2</sub> O <sub>2</sub> (cfu)
Tarkett® 1	>644	63
Tarkett® 2	271	78
Tarkett® 3	>909	46
Tarkett® 4	>378	72
Tarkett® 5	>333	43
Tarkett® 6	>1600	63

# Challenge study 4: VRE on various hospital surfaces using vapourised H<sub>2</sub>O<sub>2</sub>

- Results:

Surface	Untreated (cfu)	H <sub>2</sub> O <sub>2</sub> (cfu)
Vinyl 1	>1073	190
Vinyl 2	>680	13
Vinyl 3	>1293	110
Vinyl 4	>833	88
Vinyl 5	>571	67
Vinyl 6	>1180	156



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# Photocatalytic Efficacy Data



# Field study 5: reduction of microbial burden in surgical theatre by photocatalysis

- Disinfection technology: photocatalysis
- Study details: surgical theatre, baseline bacterial and fungal cultures collected, and isolates identified using classical methods
- Results: 24 hours after installation and use of the photocatalytic reactor up to a 300% reduction of airborne microbes was achieved

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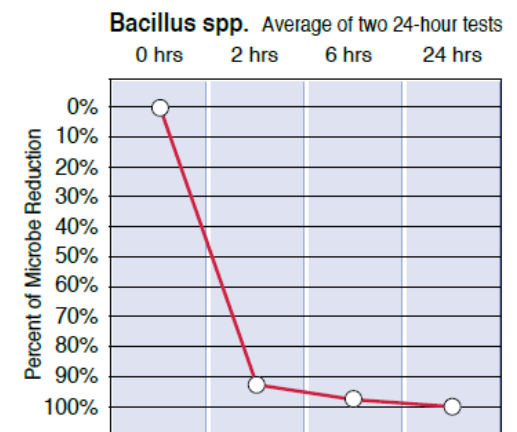
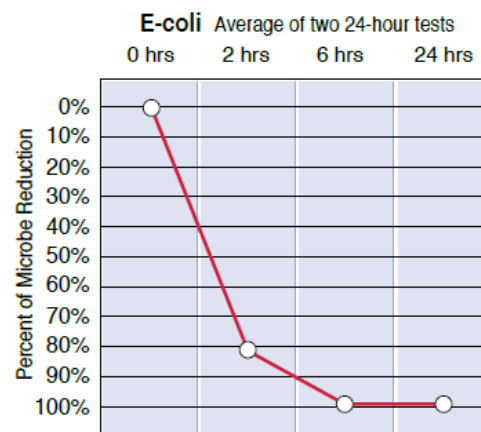
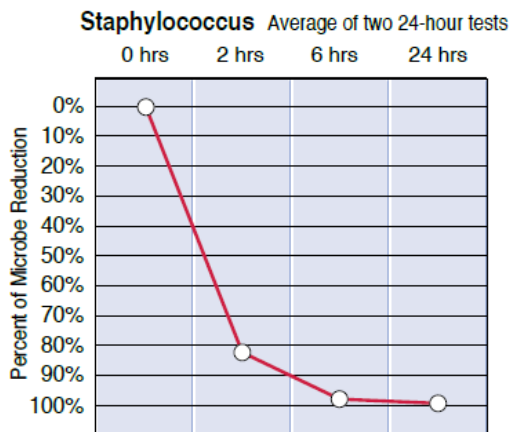
PEER-REVIEW PAPER

**Reducing Airborne Microbes in the Surgical  
Operating Theater and Other Clinical Settings**  
A Study Utilizing a Unique Photocatalytic  
Reactor Biocide Unit

Nicholas Cram, MEng, CBET, CHSP, Nolan Shipman, MD, and John M. Quarles, PhD  
From the Biomedical Engineering Department, Texas A&M University, College Station, Shipman-Cram  
Medical Research, College Station (Mr Cram); The Physicians Centre, Bryan, Shipman-Cram Medical  
Research, Bryan, Tex (Dr Shipman); and Department of Medical Microbiology and Immunology,  
College of Medicine, Texas A&M University, College Station (Dr Quarles).

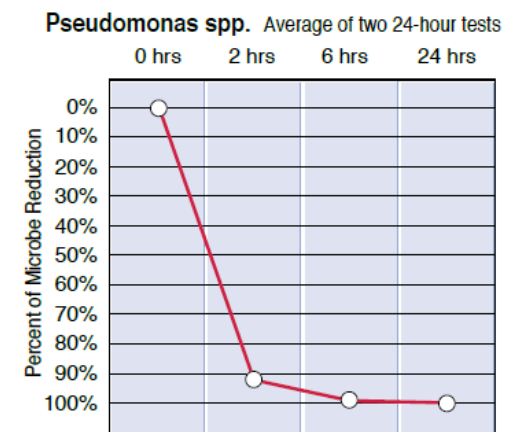
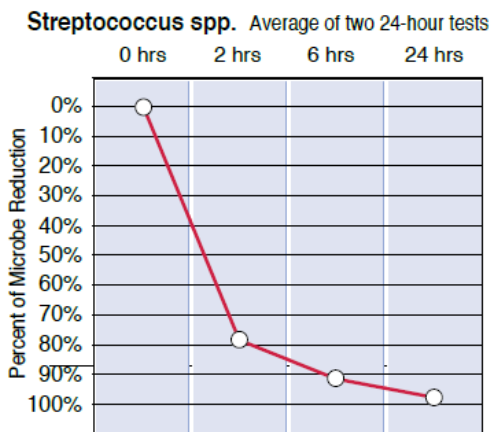
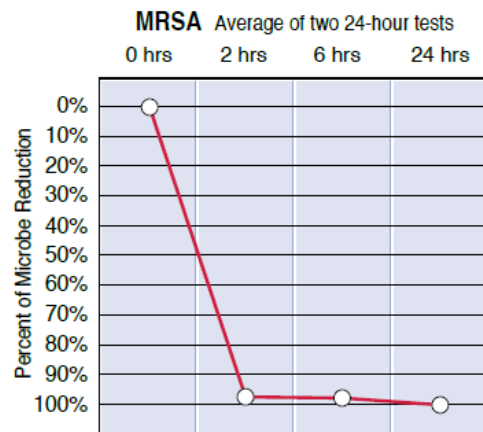
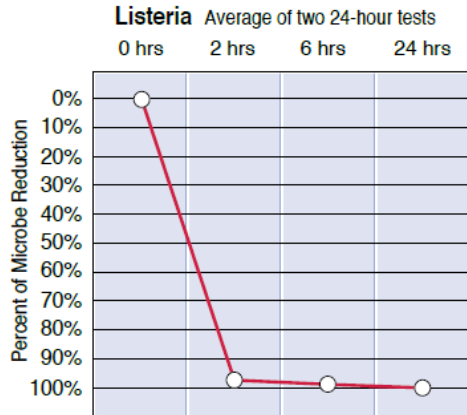
# Challenge study 5: photocatalytic decontamination of various microbes

- Disinfection technology: photocatalysis
- Study details: decontamination of surfaces individually artificially contaminated with 7 different types of bacteria (*Escherichia coli*, *Staphylococcus*, *Bacillus*, methicillin resistant *Staphylococcus aureus*, *Streptococcus*, *Pseudomonas*, *Listeria*) and 2 different fungi (*Candida albicans* and *Stachybotrys*) over 24 hours
- Results:



# Challenge study 5: photocatalytic decontamination of various microbes

- Results (continued):



# Challenge study 5: photocatalytic decontamination of various microbes

- Results (continued):

