



Antimicrobial Effectiveness Review

SUMMARY OF EXPERIMENTAL WORK TO DATE

Stephen McGrath BSc, MBS, MSc, PhD

May 2022

Healthcare acquired infections

Healthcare acquired infections (HAI's) are a serious issue for patients and the medical profession in general. The Irish nurses and midwife's organisation (INMO) estimate the economic burden for Ireland runs to €1.75 Million per hospital per year, while estimates for the UK and US vary between €1-2 Billion and \$28-34 Billion, respectively. In recent years the emergence of antibiotic resistance in strains of bacteria such as methicillin resistant *Staphylococcus aureus* (MRSA) and vancomycin resistant *Enterococci* (VRE) amongst others, have posed a significant challenge for Health care providers, while at the time of writing the global COVID-19 pandemic has highlighted the weaknesses of cross-infection prevention in even the most advanced healthcare settings.

CMC-Hygea Products

CMC-Hygea provides a range of healthcare products aimed at preventing infection in both healthcare and community settings. The innovative product range utilise the unique antimicrobial properties of silver ion technology. The antiseptic properties of silver have been studied and utilised for many years and its broad spectrum of activity makes it particularly potent against a wide range of microorganisms, including antibiotic-resistant strains. Furthermore, the incorporation of the silver ion technology in the constituent product material means that CMC-Hygea products are inherently antimicrobial throughout their lifetime while the broad-spectrum activity provides protection against bacteria, viruses, yeasts and mould.

Antimicrobial Test Results

CMC-Hygea have been challenging the antimicrobial activity of their products against medically significant microorganisms for the last decade and have built a significant dossier of data demonstrating effectiveness against causative agents of HAI's. Testing has been conducted in independent laboratories in accordance with the applicable International Organisation for Standardization (ISO) testing protocols. The purpose of this report is to summarise the data generated to date.

TEST PHASE I

Date: October 2013

Laboratory: Industrial Microbiological Services (IMSL) Ltd.

Test Material: PAIL Liner and Dish

Testing Protocol: ISO 22196 "Plastics- Measurement of antibacterial activity on plastic surfaces"

Test organisms: *Escherichia coli*

Staphylococcus aureus

Methicillin Resistant *Staphylococcus aureus* (MRSA)

Vancomycin resistant *Enterococci* (VRE)

Results:

Test Material	Microorganism	Antibacterial effect (% CFU reduction relative to control material)
Liner	<i>E. coli</i>	84.27%
	<i>S. aureus</i>	≥99.99%
	MRSA	99.95%
	VRE	≥99.99%
Dish	<i>E. coli</i>	≥99.99%
	<i>S. aureus</i>	99.97%
	MRSA	99.78%
	VRE	99.75%

TEST PHASE II

Date: June 2017

Laboratory: Industrial Microbiological Services (IMSL) Ltd.

Test Material: PathAguard ABLiS Liner and Dish

Testing Protocol: ISO 22196 "Plastics- Measurement of antibacterial activity on plastic surfaces"

Test organisms:

- Escherichia coli* (ATCC 8739)
- Klebsiella pneumoniae* (ATCC 4352)
- Carbapenem resistant *Klebsiella pneumoniae* (ATCC 4352)
- Vancomycin resistant *Enterococci* (VRE) (DSM 13591)
- Methicillin resistant *Staphylococcus aureus* (MRSA) (NCTC 13142)
- Carbapenem resistant *Acinetobacter baumannii* (NCTC 13424)
- Vancomycin resistant *Enterococcus faecium* (ATCC 700221)

Results:

Test Material	Microorganism	Antibacterial effect (% CFU reduction relative to control material)
Liner	<i>E. coli</i>	≥99.99%
	<i>K. pneumoniae</i>	≥99.99%
	CPR- <i>K. pneumoniae</i>	≥99.99%
	VR- <i>Enterococci</i>	≥99.99%
	MRSA	≥99.99%
	CPR- <i>A. baumannii</i>	≥99.99%
	VR- <i>E. faecium</i>	99.89%
Dish	<i>E. coli</i>	≥99.99%
	<i>K. pneumoniae</i>	≥99.99%
	CPR- <i>K. pneumoniae</i>	≥99.99%
	VR- <i>Enterococci</i>	≥99.99%
	MRSA	≥99.99%
	CPR- <i>A. baumannii</i>	99.98%
	VR- <i>E. faecium</i>	98.09%

TEST PHASE III

Date: February 2021

Laboratory: Vismederi Textyle S.r.l.

Test Material: PathAguard ABLiS Liner

Testing Protocol: ISO 21702 “Measurement of antiviral activity on plastics and other non-porous surfaces”

Test organisms: SARS-CoV-2_COV2019 ITALY/INMI1

Results:

Test Material	Microorganism	Antiviral effect
Liner (6 hrs)	SARS-CoV-2_COV2019 ITALY/INMI1	68.38%
Liner (24 hrs)	SARS-CoV-2_COV2019 ITALY/INMI1	97.43%

Conclusion

The data presented in this summary report includes the results of antimicrobial effectiveness testing against a total of 9 microbial strains. This panel of microorganisms was selected as it represents the most prevalent isolates associated with HAI's globally. As can be seen from the data the inclusion of silver ion technology in the product material confers a life-time long antimicrobial activity capable of reducing the number of viable cells by a factor of 3-4 logs which is equivalent to a 1000 to 10,000 fold reduction for the majority of isolates tested. Significantly, this cohort includes the antibiotic-resistant bacteria:

- Methicillin Resistant *Staphylococcus aureus*
- Carbapenem-resistant *Klebsiella pneumoniae*
- Vancomycin resistant *Enterococci*
- Carbapenem resistant *Acinetobacter baumannii*
- Vancomycin resistant *Enterococcus faecium*

The data demonstrates that the material maintains its antimicrobial effectiveness against antibiotic resistant strains e.g. $\geq 99.99\%$ reduction for both *Klebsiella pneumoniae* and Carbapenem resistant *Klebsiella pneumoniae*.

Furthermore, the latest data from Test Phase III demonstrates antiviral activity against the SARS-CoV-2 virus, the causative agent of COVID-19. This latest data is significant given recent experience with the containment of COVID-19 cross infection in both healthcare settings and the community at large.

The data presented in this summary clearly highlights the broad-spectrum antimicrobial activity conferred to CMC-Hygea products through the incorporation of the silver ion technology and the potential that these products offer for the reduction in the incidence of HAI's for patients in healthcare settings.