Continuous Antimicrobial Protection

Problem we are Seeking to Address

- HAI are increasing
- ARO are increasing
- Costs are going up
- Investment in staff and ongoing measures to fight above are constrained by today's tightening hospital budgets
- The Challenge is growing bigger while our resources are shrinking smaller

A System Based Approach is being Implemented

- Patient
  - Right drug, right bug, etc.
- Healthcare worker
  - handwashing, flawlessly executing disinfection protocols, etc.
- Patient Environment
  - Patients shed bacteria on to inanimate objects. Disinfection protocols
  - Terminal cleaning is attempt to remove risk to next patient
  - Objective in patient environment is to reduce microbiological burden to increase safety of patients and HC workers

Current Approach to Dealing with Patient Environment:

- Spray and wipe disinfection protocols
- Hydrogen peroxide misting
- UV lights
- Handwashing protocols
- All of above represent **Discontinuous Systems** and **Strategies**

Could a New Approach Further Reduce Microbiolocial Burden and Further Reduce Risk?

- Technology is now available that provides **Continuous** Microbiological Control Measures throughout a 24hr hour day
- **Continuous Control** between active disinfection steps is possible

Disinfection vs. Continuous Antimicrobial Activity

Disinfection:

- Regulated differently by Regulatory Authorities
- Disinfectants have kill claims
- Reduce bacterial numbers rapidly
- Need right product, right concentration, right dwell time, right application
- Bacterial burden can return to pre-disinfection state in 2 to 6 hours
- There exists opportunity for HAI transmission despite best written and implemented disinfection protocols

Continuous Antimicrobial Activity:

Surface Antimicrobials:

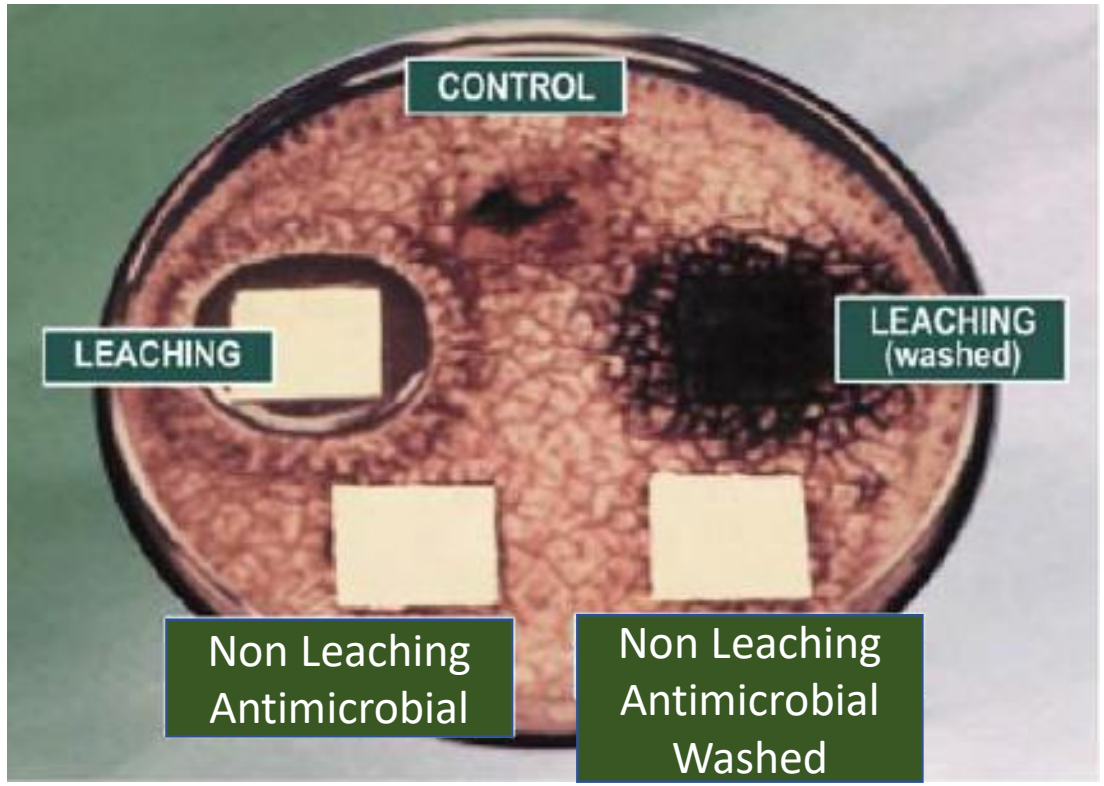
- Surface antimicrobials protect surfaces from the growth of microorganisms, not people
- Surface antimicrobials stop or mitigate the growth of microbes to reduce the burden
- Where reduced financial resources have limited the availability of nursing and environmental service personnel, equipment, products, etc. cleaning and disinfecting of high risk / high touch surfaces each and every day is a real challenge

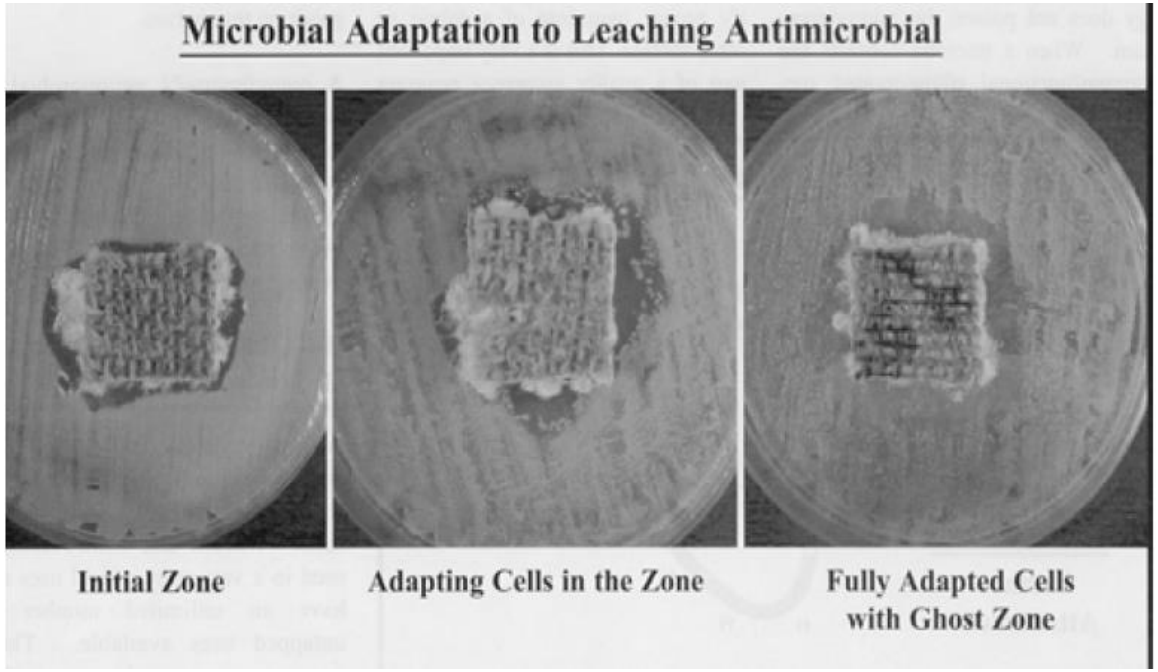
Leaching vs Non-Leaching Surface Antimicrobials

- Leaching
- Mode of action
- Visuals of lab samples of treated samples of leaching vs non leaching antimicrobials
- Zones of inhibition, risk of adaptation for leaching antimicrobials

Leaching vs non leaching Surface Antimicrobials

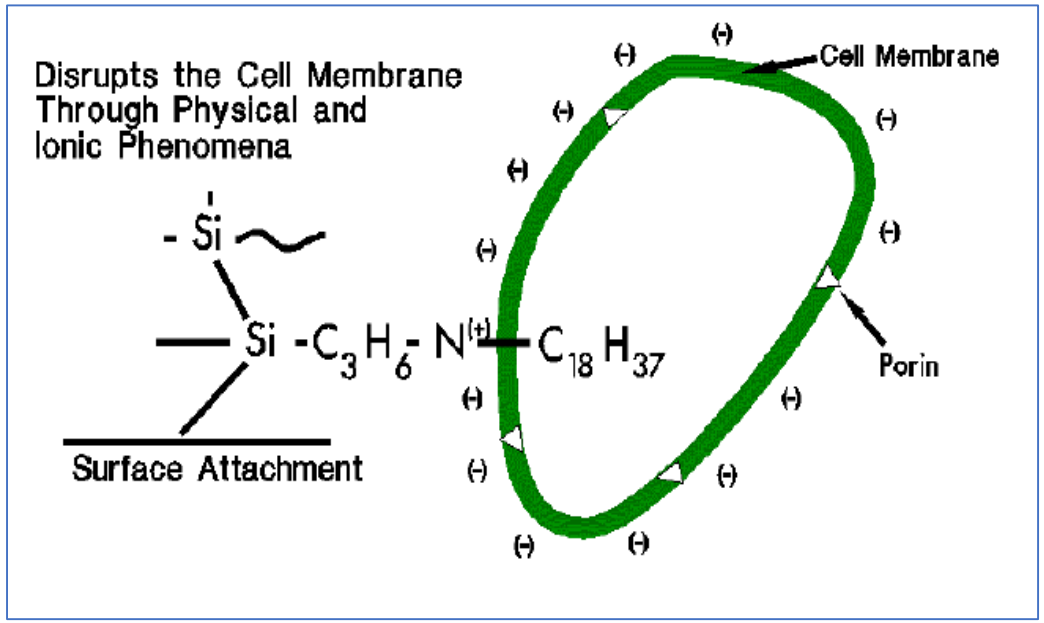
Tin, silver, copper are all examples of leaching antimicrobials

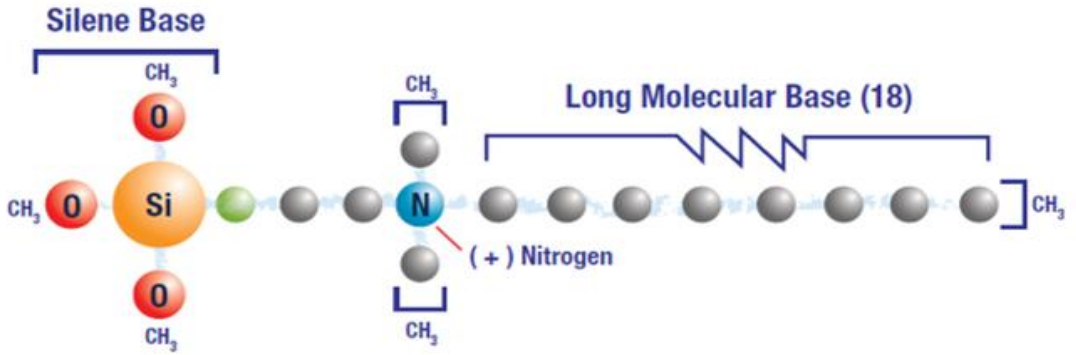




Non Leaching Organosilanes

- Octadecyldimethyltrihydroxy- silylpropyl Ammonium Chloride
- Mode of Action: Physical disruption of cell wall and ionic phenomena





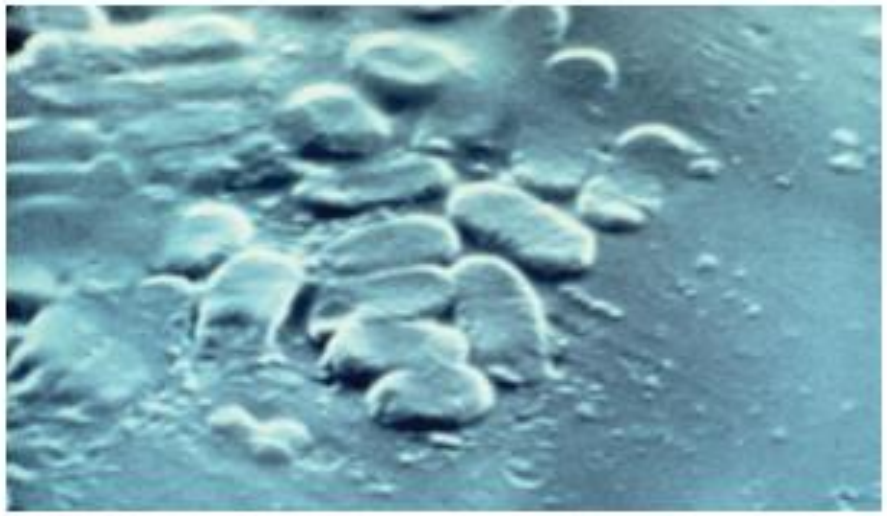
Non Leaching Organosilanes

- Creates a durable microbiostatic coating which prevents the growth of microorganisms
- Protects against virtually any microorganism with a cell wall
- A conventional quaternary ammonia salt that has been spliced to a silane bonding molecule
- Tenacious bonding capabilities, once applied to a surface it bonds to all available receptor sites
- No dislodgeable residue, odor, off gassing, migration or diffusion
- Does not work by poisoning microbes, like an antibiotic which can lead to resistant or adaptive organisms
- Does not work by diffusion away from a treated surface like a metal (silver)

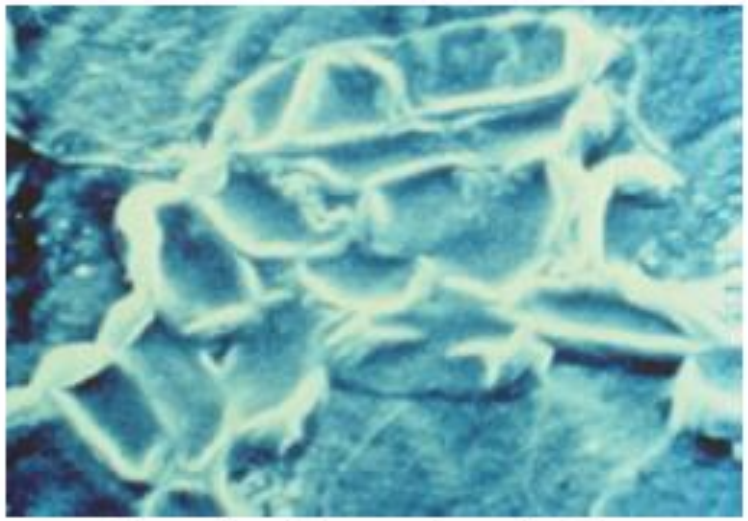
Non Leaching Organosilanes:
An Adjunct to Current Disinfection Protocols

- Do not replace existing products nor protocols
- Once every 90 day application for typical surfaces
- Target surfaces are not the entire hospital
- High touch high risk surfaces
- Door knobs, bed rails, toilets, sinks, tables, trays, carts, commodes
- Applied by a wipe format just like a disinfectant

Efficacy of Surface Modifiers Offering Continuous Protection



Normal *E. coli* cells on untreated surface.



E. coli cells ruptured after contact with treated surface.

Activity of Shield Sprayed Polypropylene against Escherichia coli and Staphylococcus aureus using ISO 22196:2011.

Table 1: Activity Against *Escherichia coli*

(Geometric Mean of Replicates as Colony Forming Units cm^2)

Sample	Contact Time		Reduction From Control	
		24 Hours	Log	%
IMSL Polypropylene Unsprayed	2.2×10^4	1.8×10^5	-	-
IMSL Polypropylene Sprayed	2.2×10^4	≤ 11.1	≥ 4.2	≥ 99.99

Table 2: Activity Against *Staphylococcus aureus*

(Geometric Mean of Replicates as Colony Forming Units cm^2)

Sample	Contact Time		Reduction From Control	
		24 Hours	Log	%
IMSL Polypropylene Unsprayed	2.5×10^4	8.6×10^5	-	-
IMSL Polypropylene Sprayed	2.5×10^4	≤ 11.1	≥ 2.9	≥ 99.99

Jun Yang et al. Antimicrobial Effects of AEGIS Solution on E.coli. Microbiology Laboratory, University of Western Ontario, 2013

Table 1: **Efficacy of different concentrations of AEGIS against different concentrations of E. Coli on Plastic surfaces**

Time (hours)	PLASTIC					
	10^4 CFU ml E. coli			10^4 CFU ml E. coli		
	50 µl AEGIS	150 µl AEGIS	Control	50 µl AEGIS	150 µl AEGIS	Control
0	0%	0%	0%	0%	0%	0%
1	100%	100%	9.8%	91.2%	93.2%	0%
2	-	100%	29.7%	-	-	-
3	100%	100%	36.3%	-	-	-

Table 2: **Efficacy of different concentrations of AEGIS against different concentrations of E. Coli on Glass surfaces**

Time (hours)	GLASS					
	10^4 CFU ml E. coli			10^4 CFU ml E. coli		
	50 µl AEGIS	150 µl AEGIS	Control	50 µl AEGIS	150 µl AEGIS	Control
0	0%	0%	0%	0%	0%	0%
1	>99%	>99%	0%	>99%	>99%	0%

ASTM E2149-01 Standard Test Method for Determining the Antimicrobial Activity of Immobilized Methicillin Resistant Staphylococcus aureus (MRSA) Aegis Environmental; Midland MI.

	MICROBIOLOGICAL ANALYSIS		
	Initial Concentration	Final Concentration	Percent Reduction
Untreated Fabric Sample	1.8×10^5 / ml	1.9×10^5 / ml	0%
Treated Fabric Sample	1.8×10^5 / ml	$<1.0 \times 10^1$ / ml	>99.99%

Tamimi A. Et al, Long Term Efficacy of a Self-Disinfecting Coating in an Intensive Care Unit. American Journal of Infection Control 42: (2014) 1178-81

Table 2
Average (arithmetic mean) total bacterial numbers (cfu) isolated on 100 cm^2 from fomites and percent reduction after treatment

		Weeks after treatment				
Variable	Baseline*	1	2	4	8	15
Number of samples	95	81	64	64	64	45
Average number of bacteria	233,064	98	80	43	2,247	3,320
Range	10-7,000,000	10-2,500	10-840	10-2,500	10-44,000	10-57,000
% reduction	NA	99.96	99.97	99.98	99.04	98.58

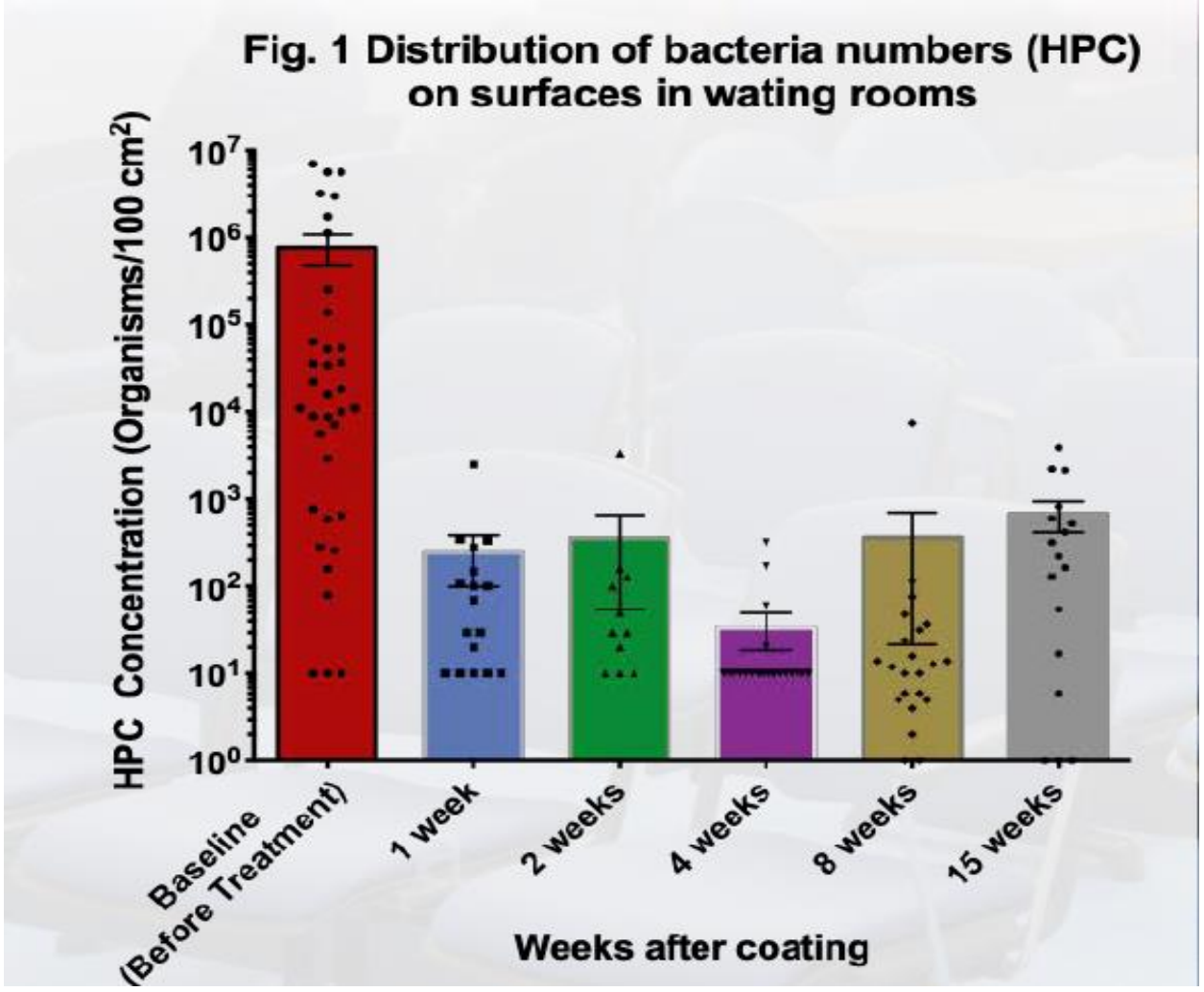
NA, not applicable.
*Before treatment.

Table 4
Isolation of antibiotic-resistant bacteria (percent of positive sites)

		Weeks after treatment				
Variable	Baseline*	1	2	4	8	15
Number of samples	95	81	64	64	64	45
VRE	14	0	0	0	1	0
MRSA	7	0	0	0	0	0
CRE	3	0	0	0	0	0
C difficile	0	0	0	0	0	0
Overall percentage	25	0	0	0	1.5	0

*Before treatment.

Gerba C, et al. Long term impact of a disinfectant with residual activity on suppression of bacteria on fomites in hospital waiting rooms. 6th International Symposium on Food and Environmental Virology. Phoenix AZ Oct 10, 2018.



"Bacterial numbers were always 99% less on surfaces after the treatment for four weeks, 96% after eight weeks and still almost 89% after 15 weeks"

Summary

- A surface modification strategy as an adjunct to existing protocols can reduce microbial burden on high touch, high risk surfaces through imparting Persistent Antimicrobial Activity
- Non Leaching Organosilanes are proven to provide significant reductions in microbial burden
- Non Leaching Organosilanes
  - Health Canada Registration:

To impart durable, broad-spectrum, antimicrobial protection to existing non-food contact building surfaces (porous or nonporous) to control and/or prevent microbial growth.