



FOR FULL REPORTS SEE: 1) Alcohols, CRA Newsletter Nov. '96, 20:1-2. 2) Chlorines, CRA Newsletter Mar. '94, 18:2. 3) Cleaner, CRA Newsletter Jul '02, 26:3. 4) Phenolics, CRA Newsletter Jan. '95, 19:2-3. 5) Quats, CRA Newsletter Dec. '00, 24:2-3. 6) Wipes, CRA Newsletter Apr. '99, 23:3.

## ENVIRONMENTAL SURFACE DISINFECTANTS

Disinfectants for environmental surfaces must kill *rapidly & thoroughly*. To identify products meeting these requirements, CRA purchased & tested disinfectants from all over the world. Following chart of products still on the market & tested by CRA summarizes 18 alcohol-based products where only 2 passed all tests used by CRA; 10 chlorine-based products where only 2 passed all tests used by CRA; 1 chlorine & bromine-based product, 2 iodophore-based products, 4 products with miscellaneous active ingredients, 6 phenolic-based products, 6 quaternary ammonium chloride-based products, & 4 wipes where none passed all tests used by CRA.

### MATERIALS & METHODS.

Tuberculosis bacteria & polio virus are used as test organisms because they are human pathogens with known resistance to kill by many disinfectants. Results are reported as log<sub>10</sub> reductions of 10<sup>7</sup> test organisms exposed to disinfectants for 1, 3, & 10 minutes using 3 different tests performed in triplicate, without & with fresh human whole blood present. By convention, less than a 3 log<sub>10</sub> reduction constitutes inadequate kill. Full methods are described in following publication: Christensen, R.P., et al., JADA '89; 119:493-505, & on CRA's website (www.cranews.org) under "Additional Study" (Infection Control, Environmental Surface Disinfectants, Alcohols, Nov. '96).

RED AREAS ON CHART INDICATE INADEQUATE KILL

Not tested

DISINFECTANT NAME	COMPANY	COUNTRY	MAJOR ACTIVE INGREDIENT(S)	TEST TIMES	POLIO VIRUS I (Mahoney)		TUBERCULOSIS ORGANISM ( <i>M. bovis</i> )			
					SUSPENSION TEST		SUSPENSION TEST		SURFACE TEST	
					WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD
<b>ALCOHOL-BASED</b>										
1. 70% ETHYL RUBBING ALCOHOL	Walgreens	USA	70% Ethanol	1 min. 2.0	0.0	4.3	4.0			
				3 min. 3.5	0.0	4.3	4.2	4.0	3.9	
				10 min. 4.8	0.1	4.4	4.2			
2. BACTOL BLUE	Whiteley Industries	Australia	70% Ethyl alcohol (w/w)	1 min. 1.0	0.1	>5.1	4.5			
				3 min. 3.1	0.2	>5.1	4.9	>5.5	3.8	
				10 min. 3.7	0.3	>5.1	5.3			
3. BIOSURF	Micrylium	Canada	70.5% Ethyl alcohol (w/w) 0.20% Chlorhexidine Gluconate (w/w)	1 min. 4.1	0.7	5.4	4.4			
				3 min. 4.9	2.0	5.6	4.4	5.4	3.9	
				10 min. 4.9	2.1	5.6	4.5			
4. CITRACE	Caltech Industries	USA	66.6% Ethyl alcohol (w/w)	1 min. 4.4	0.3	>4.7	4.4			
				3 min. 4.4	1.0	>4.7	4.4	5.0	3.9	
				10 min. 3.9	1.5	>4.5	4.6			
5. CITREX	Caltech Industries	USA	69.1% Ethyl alcohol (w/w)	1 min. 4.1	0.9	>4.6	>4.6			
				3 min. >5.0	1.6	>4.6	5.2	>5.1	3.8	
				10 min. >5.0	2.3	>4.6	5.2			
6. CLOROX DISINFECTING SPRAY	The Clorox Company	USA	65.0% Ethyl alcohol (w/w) 0.63% Quaternary ammonium chloride	1 min. 3.2	0.2	4.7	5.3			
				3 min. >3.2	0.5	4.8	5.2	5.0	3.4	
				10 min. >3.2	1.4	4.8	5.2			
7. FD 320	Orochemie	Germany & Canada	42% 1-propanol (w/v) 10% Ethyl alcohol (w/v)	1 min. 0.0	0.0	5.4	3.7			
				3 min. 0.0	0.0	5.4	5.0	>5.6	4.7	
				10 min. 0.3	0.0	>5.1	5.0			
8. FD 322	Orochemie	Germany & Canada	32% 1-propanol (w/v) 26% Ethyl alcohol (w/v)	1 min. 0.0	0.0	5.7	4.8			
				3 min. 0.2	0.0	>5.1	>4.7	>4.9	4.3	
				10 min. 0.7	0.0	5.4	>4.7			
9. FORMAL SPRAY	Courtin	England	43.5% Ethyl alcohol (w/v) 19.6% 2-propanol (w/v) 4.0% 1-propanol (w/v)	1 min. 0.2	0.0	>5.1	5.8			
				3 min. 0.6	0.0	5.4	>5.5	>5.9	3.3	
				10 min. 1.0	0.0	>5.1	>5.5			
10. G <sub>2</sub>	Germiphene	Canada	70.5% Ethyl alcohol (w/w) 0.2% Chlorhexidine Gluconate (w/w)	1 min. <1.6	0.0	4.9	4.2			
				3 min. 3.2	0.5	4.8	4.3	5.3	4.1	
				10 min. 4.5	1.1	4.8	4.3			
11. GENERIC RUBBING ALCOHOL	Bergen Brunswig Drug	USA	70% Isopropyl alcohol (v/v)	1 min. 0.0	0.0	5.3	4.9			
				3 min. 0.0	0.0	>5.0	>4.6	5.2	3.7	
				10 min. 0.0	0.0	>5.0	>4.6			
12. GERMEXTRA	Germiphene	Canada	79% Ethyl alcohol (w/w) 0.2% Quat. ammonium chloride (w/w) 0.1% Phenolic (w/w)	1 min. 4.3	1.8	5.0	4.2			
				3 min. 4.2	3.4	5.0	4.3	4.9	3.4	
				10 min. 4.2	>3.8	5.5	4.6			
* 13. GLEN 20	Reckitt Benckiser	Australia	68% Ethyl alcohol (w/w)	1 min. >5.3	3.7	5.1	5.2			
				3 min. 5.5	>4.0	5.0	5.2	4.4	3.2	
				10 min. >5.5	3.9	4.4	5.5			
* 14. LYSOL BRAND II DISINFECTANT SPRAY (Canadian)	Reckitt Benckiser	Canada	68% Ethyl alcohol (w/w)	1 min. >5.0	1.6	5.6	5.9			
				3 min. >5.0	2.2	5.4	5.5	5.5	3.6	
				10 min. >5.0	2.8	5.3	5.9			
* 15. LYSOL BRAND II DISINFECTANT SPRAY	Reckitt Benckiser	USA	79% Ethyl alcohol (w/w) 0.1% Quat. ammonium chloride (w/w)	1 min. >4.1	>4.1	4.5	4.9			
				3 min. >4.2	>4.2	4.5	5.1	5.9	4.4	
				10 min. >4.2	>4.1	4.6	4.8			
16. SURFEX-E	Microbex	Canada	70% Ethyl alcohol (w/w)	1 min. >4.4	0.3	>5.1	>5.2			
				3 min. >4.5	1.6	>5.1	5.4	5.3	2.8	
				10 min. >4.5	1.8	>5.1	>5.2			
17. T <sup>6</sup> DISINFECTANT	ALDA Pharmaceuticals	Canada	69.7% Ethyl alcohol (v/v) 0.28% o-phenylphenol (w/v) 0.20% Benzalkonium chloride (w/v)	1 min. 0.9	0.1	5.1	4.1			
				3 min. 2.8	0.3	4.9	4.2	>5.0	4.0	
				10 min. 4.7	0.5	5.0	4.3			
18. VIRAGUARD	Veridien	USA	70% Isopropyl alcohol (w/w)	1 min. 0.0	0.0	5.3	>5.3			
				3 min. 0.0	0.0	>5.3	>5.3	4.6	3.6	
				10 min. 0.0	0.0	5.0	>5.1			

NOTE: All Clorox tests included both the Household and Institutional brands. Results for both brands at the same dilutions were similar & were therefore combined in chart below.

DISINFECTANT NAME	COMPANY	COUNTRY	MAJOR ACTIVE INGREDIENT(S)	TEST TIMES	POLIO VIRUS I (Mahoney)		TUBERCULOSIS ORGANISM ( <i>M. bovis</i> )			
					WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD
* 1-2. CLOROX 1:2 (Household & Institutional)	The Clorox Company	USA	2.63% Sodium hypochlorite	1 min. >5.2	>4.8	>5.8	>6.2			
				3 min. >5.2	>4.8	>6.1	>6.2	6.1	3.3	
				10 min. >5.2	>4.8	>6.1	>6.2			
* 3-4. CLOROX 1:5 (Household & Institutional)	The Clorox Company	USA	1.05% Sodium hypochlorite	1 min. >5.2	>4.5	>6.1	1.6			
				3 min. >5.4	>4.5	>6.1	4.0	6.5	1.8	
				10 min. >5.3	>4.5	>6.1	6.1			
* 5-6. CLOROX 1:10 (Household & Institutional)	The Clorox Company	USA	0.53% Sodium hypochlorite	1 min. >5.2	4.5	5.7	0.6			
				3 min. >5.2	>4.6	>6.2	0.8	6.3	1.1	
				10 min. >5.0	>4.5	>6.2	1.7			
* 7-8. CLOROX 1:100 (Household & Institutional)	The Clorox Company	USA	0.05% Sodium hypochlorite	1 min. >4.6	1.1	>5.2	0.5			
				3 min. >4.4	1.3	>6.2	1.0	2.7	0.1	
				10 min. >4.4	1.4	>6.2	1.6			
* 9. EXSPOR 4:1:1	Alcide	USA	0.26% Sodium chlorite	1 min. >5.2	>4.4	>6.0	>5.2			
				3 min. >5.1	>4.3	>6.0	>6.2	3.0	0.1	
				10 min. >5.2	>4.3	>6.0	>6.2			
* 10. XINIX Surface-Concentrate (3:50)	XINIX DTI	Sweden	1500 ppm Chlorine dioxide	1 min. 4.8	<0.2	>4.7	0.0			
				3 min. >4.7	<0.1	>4.7	0.0	0.2	1.3	
				10 min. >4.6	<0.1	>4.7	0.0			

\* at left of product name indicates product passed all tests used by CRA.

OVER →

**RED AREAS ON CHART INDICATE INADEQUATE KILL**

Not tested

POLIO VIRUS I (Mahoney)    TUBERCULOSIS ORGANISM (*M. bovis*)

DISINFECTANT NAME	COMPANY	COUNTRY	MAJOR ACTIVE INGREDIENT(S)	TEST TIMES	SUSPENSION TEST		SURFACE TEST		SURFACE TEST	
					WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD	WITHOUT BLOOD	WITH BLOOD
<b>CHLORINE &amp; BROMINE-BASED</b>										
1. MICROSTAT 2	Septodont	USA	700-800 ppm Chloride & Bromide	1 min.	>4.0	3.1	4.5	0.0		
				3 min.	>4.1	3.3	5.2	0.0		
				10 min.	>4.1	3.3	5.2	0.0		
<b>IODOPHORE-BASED</b>										
1. IODOFIVE (1:213)	Certol International	USA	75 ppm Iodine	1 min.	0.3	0.0	1.8	0.0		
				3 min.	0.4	0.0	5.3	0.0	1.5	0.0
				10 min.	1.9	0.1	4.8	0.0		
2. WESCODYNE (1:213)	Steris Corporation	USA	75 ppm Iodine	1 min.	0.3	0.0	1.8	0.0		
				3 min.	0.4	0.0	5.3	0.0	1.5	0.0
				10 min.	1.9	0.1	4.8	0.0		
<b>MISCELLANEOUS ACTIVE INGREDIENTS</b>										
1. ECOTRU PROFESSIONAL	EnviroSystems, Inc.	USA	0.20% Parachlorometaxylene (w/v)	1 min.	0.1	0.0	0.3	0.9		
				3 min.	0.1	0.0	2.0	2.5	4.4	2.4
				10 min.	0.1	0.0	5.1	4.8		
2. LYSOL BRAND I.C. READY TO USE DISINFECTANT CLEANER	Reckitt Benckiser Professional	USA	2.50% Citric Acid	1 min.	>4.5	0.1	0.1	0.0		
				3 min.	4.9	0.0	0.1	0.1	1.5	1.2
				10 min.	>4.6	0.8	0.2	0.1		
3. Opt/M 33 TB	SciCan	Canada	0.5% Accelerated™ Hydrogen Peroxide (w/w)	1 min.	>4.2		1.5	4.4		
				3 min.	>4.2		4.9	5.7	6.2	4.4
				10 min.	>4.1		>5.1	>5.4		
4. VIRKON (1% SOLUTION)	Antec International Ltd.	England	5% Potassium peroxomonosulphate 1.5% Sodium alkyl benzene sulphonate 0.5% Sulphamic acid	1 min.	4.5	0.0	0.8	0.4		
				3 min.	>4.9	0.5	0.8	0.4	1.6	0.3
				10 min.	>5.0	2.3	0.9	0.3		
<b>PHENOLIC-BASED</b>										
1. BIREX <sub>SE</sub> (1:256)	Biotrol International	USA	0.03% o-phenylphenol 0.03% p-tertiary amylphenol	1 min.	4.1	0.3	0.2	0.0		
				3 min.	>4.7	0.3	3.0	0.0	2.9	0.3
				10 min.	>4.7	0.3	>5.1	0.0	1.1	0.2
2. LYSOL I.C. PHENOLIC HOSPITAL DISF/CLEANER (1:128)	Reckitt Benckiser Professional	USA	0.02% o-phenylphenol 0.06% o-benzyl-p-chlorophenol	1 min.	0.0	0.7	0.8	0.2		
				3 min.	0.0	0.6	4.5	2.2	3.3	1.1
				10 min.	0.0	0.7	>6.2	5.1	0.7	0.6
3. PROFESSIONAL AMPHYL DISINFECTANT CLEANER (1:200)	Reckitt Benckiser Professional	USA	0.05% o-phenylphenol 0.03% o-benzyl-p-chlorophenol	1 min.	0.0	0.9	2.9	0.1		
				3 min.	0.0	0.7	>5.1	1.0	2.7	0.7
				10 min.	0.0	0.7	>5.1	4.9	1.3	0.3
4. PROFESSIONAL AMPHYL HOSPITAL BULK DISF/CLEANER (3:100)	Reckitt Benckiser	USA	0.08% o-phenylphenol 0.08% o-benzyl-p-chlorophenol 0.65% Other misc. active ingredients	1 min.	0.0	0.2	1.4	0.0		
				3 min.	0.0	0.3	5.4	0.2	4.1	1.1
				10 min.	0.0	0.3	>5.1	0.9	4.6	0.9
5. PROSPRAY C-60 Not diluted	Certol International	USA	0.28% o-phenylphenol 0.03% o-benzyl-p-chlorophenol	1 min.	0.0	0.3	0.9	0.0		
				3 min.	0.0	0.4	5.4	0.4	3.6	0.9
				10 min.	0.0	0.6	>6.2	3.0	2.8	0.7
6. SPORICIDIN Not diluted	The Sporicidin Company	USA	1.56% Phenol 0.06% Sodium phenate	1 min.	0.0	0.2	2.5	2.2		
				3 min.	0.0	0.1	>5.2	4.2	>5.6	4.4
				10 min.	0.1	0.2	>5.2	5.8	5.7	5.0
<b>QUATERNARY AMMONIUM-BASED</b>										
1. BBJ SPRAY DISINFECTANT/CLEANER	BBJ Environmental Solutions, Inc.	USA	0.21% Quaternary ammonium chloride	1 min.	>4.1	0.0	0.0	0.1		
				3 min.	>4.2	0.0	0.1	0.2	2.4	2.7
				10 min.	>4.0	0.0	0.2	0.5		
2. CAVICIDE	Metrex Research	USA	0.28% Quaternary ammonium chloride 17.2% Isopropyl alcohol (w/w)	1 min.	3.5	0.0	1.0	1.9		
				3 min.	>3.8	0.1	1.9	2.4	1.7	2.4
				10 min.	>3.9	0.1	4.3	4.4		
3. LYSOL I.C. FOAMING DISF/CLEANER Not diluted	Reckitt Benckiser	USA	0.1% Quaternary ammonium chloride	1 min.	>4.8	0.3	0.1	0.0		
				3 min.	>4.7	0.5	0.2	0.1	2.3	2.4
				10 min.	>4.7	1.0	0.6	0.7		
4. MADACIDE-FD	Mada Medical Products	USA	0.308% Quaternary ammonium chloride 21.0% Isopropyl alcohol (v/v)	1 min.	0.0	0.0	1.6	1.9		
				3 min.	0.1	0.0	2.9	3.2	4.0	4.6
				10 min.	0.1	0.0	5.2	4.6		
5. STERASEPTIC 256 (1:256)	Asepsis International	USA	0.06% Quaternary ammonium chloride	1 min.	0.0	0.0	0.0	0.0		
				3 min.	0.9	0.0	0.0	0.0	0.9	0.3
				10 min.	0.0	0.0	0.0	0.0		
6. SUV (1:64)	OSHA Review	USA	0.07% Quaternary ammonium chloride	1 min.	5.0	0.0	0.0	0.0		
				3 min.	5.0	0.1	0.1	0.0	0.5	0.1
				10 min.	5.0	0.1	0.1	0.2		
<b>WIPES</b>										
1. DISCIDE ULTRA Pre-wetted	Palmero Healthcare	USA	0.24% Quaternary ammonium chloride 63.25% Isopropyl alcohol (w/w)	1 min.	0.0	0.0	3.3	4.0		
				3 min.	0.0	0.1	5.2	5.1	4.1	1.2
				10 min.	0.0	0.1	>4.4	5.1		
2. SPORICIDIN TOWELETTE Pre-wetted	The Sporicidin Company	USA	1.56% Phenol 0.06% Sodium phenate	1 min.	0.0	0.1	0.4	0.2		
				3 min.	0.0	0.0	1.4	1.0	4.1	1.1
				10 min.	0.7	0.0	4.9	3.9		
3. SUPER SANI-CLOTH Pre-wetted	Nice-Pak PDI	USA	0.5% Quaternary ammonium chloride 55% Isopropyl alcohol (w/w)	1 min.	0.0	0.3	3.4	3.3		
				3 min.	0.1	0.1	5.3	4.4	4.9	3.2
				10 min.	0.0	0.1	5.1	4.4		
4. VIRAGUARD TOWELETTES Pre-wetted	Veridien	USA	70% Isopropyl alcohol (w/w)	1 min.	0.0	0.1	4.7	4.5		
				3 min.	0.0	0.0	4.7	4.7	1.6	0.1
				10 min.	0.1	0.0	4.9	4.7		

**CRA CONCLUSIONS:** Of 51 disinfectants tested & listed above, only 4 passed all tests used by CRA, & were either ethyl alcohol or chlorine-based. Inability to inactivate a resistant virus was the most prevalent lack. These data can be helpful when selecting an environmental surface disinfectant for clinical use.

Products evaluated by CRA & reported in the CRA Newsletter have been selected on the basis of merit from hundreds of products under evaluation. CRA conducts research at 3 levels: (1) Multiple-user field evaluations, (2) Controlled long-term clinical research, & (3) Basic science laboratory research. Over 400 clinical field evaluators are located throughout the world & 40 full-time employees work at the institute. All professional staff volunteer their time. A product must meet at least one of the following standards to be reported in this publication: (1) Innovative & new on the market; (2) Less expensive, but meets the use standards; (3) Unrecognized, valuable classic; or (4) Superior to others in its broad classification. Your results may differ from CRA Evaluators or other researchers on any product because of differences in preferences, techniques, batches of products, & environments. CRA Foundation® (CRA) is a tax-exempt, nonprofit education & research organization which uses a unique volunteer structure to produce objective, factual data. All proceeds are used to support the work of CRA Foundation®. ©2006 This Newsletter or portions thereof may not be duplicated without permission of CRA. Annual English language subscription \$65 worldwide, plus GST Canada subscriptions. Single issue \$7 each. See CRA website for non-English subscriptions.