Disinfectant
Comparison Summary

SUMMARY ABSTRACT

The activity of eleven disinfectants against Staphylococcus aureus, Pseudomonas aeruginosa and Sacchromyces cerevisiae was determined using a method based on the A.O.A.C. germicidal and detergent sanitizer assay. Based on the activity against the test organisms after 30 and 60 second exposures to each disinfectant, the chlorine dioxide based ***Oxine*** *product had the highest biocidal activity in this assay.*

Late in 1987, **Bio-Cide International, Inc.** began a dialogue with Dr. Ralph Tanner at the University of Oklahoma concerning the need to document the relative effectiveness of **BCI**'s chlorine dioxide product with those currently in the marketplace. **BCI** has previously commissioned numerous bactericidal studies which demonstrated an exceedingly high biocidal activity. It was evident, however, that a direct comparison of biocidal activity between available disinfectants was difficult at best, due to the use of various testing methods, protocols and test conditions of products. It was decided that a disinfectant comparison study, based on the standard A.O.A.C. germicidal and detergent sanitizer assay, would be conducted and would include commercially available products representing the main disinfectant chemical groups. In this way, one could readily and directly compare the relative potency of disinfectant products to determine which was the most effective under identical criteria.

Because **BCI**'s chlorine dioxide products are found in a wide array of applications, it was decided to select disinfectants from both the food processing and hospital/medical environments for evaluation. Two different sodium hypochlorites were evaluated, simple bleach was identified as "chlorine compound I" while a high concentration of commercial hypochlorite solution was labeled "chlorine compound II". Since Bio-Cide has long contended that significant differences exist between chlorine dioxide based products, another chlorine dioxide based product was evaluated and identified as "chlorine compound III" while **BCI**'s chlorine dioxide product was "chlorine compound IV". The iodophor was a formula of iodine and phosphoric acid very popular for dairy equipment sanitation. Peroxide was evaluated due to its use in food processing, largely overseas and its sometime use in the medical area. The Glutaraldehyde-phenol and the acid glutaraldehyde are both medical environment disinfectants whose trade names are Sporocidin and Wavicide respectively. The quat or quaternary ammonium and the acidified quat are both private formulations specifically for the food processing area and the phenol product is the standard hard surface disinfectant used in microbiology labs throughout the country.

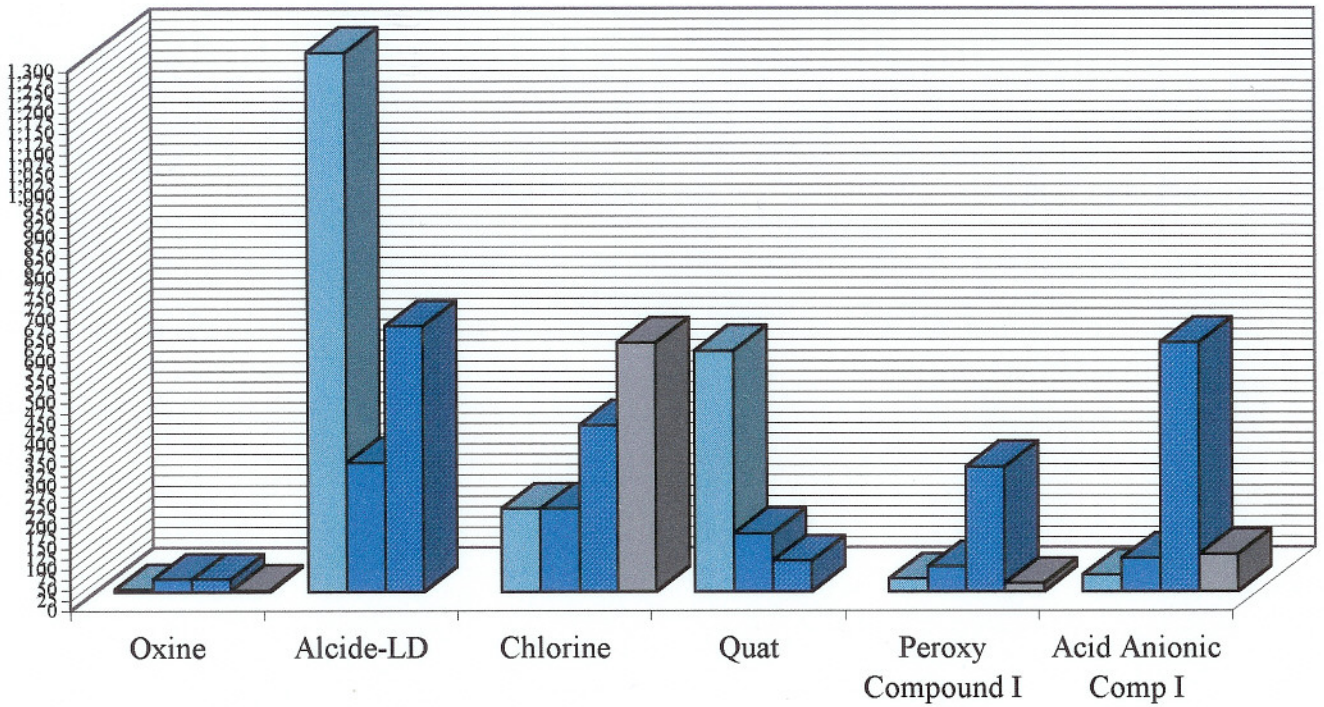
for the food processing area and the phenol product is the standard hard surface disinfectant used in microbiology labs throughout the country.

Because it is well known that different types of disinfectants often produce different kill rates on various microorganisms, 3 different organisms were used in evaluating the disinfectants. The 3 organisms, each representing a major class of microbe, were Pseudomonas aeruginosa, a gram negative bacterium, Staphylococcus aureus, a gram positive bacterium and Saccharomyces cerevisiae, a fungal yeast.

The criteria of the test itself was to determine the lowest concentration of the various disinfectants which would produce a 99.999% reduction of organism after only a 60 second contact time with the chemical. In this way, the strength or potency of the disinfectants can be seen by comparing the concentrations, expressed as parts per million (ppm) necessary to produce the required kill within the specified contact period. Those products which meet the kill criteria at low concentrations are judged to be more potent disinfectants than those that must use a high concentration to achieve the same result.

COMPARISON OF DISINFECTING AGENTS (updated)

ppm required for a 5 log reduction



By looking at the products that are effective using the lowest concentrations, it is quite clear that "chlorine compound IV" is significantly superior to all other tested products. Compound IV is **BCI**'s chlorine dioxide product, which can be found under the trade names OXINE®, PUROGENE® or SANOGENE®. This published report graphically demonstrates that the **BCI** product line of disinfectants represents the state of the art in disinfection products today and should play a significant role in disinfection programs in both the food processing and medical environments.

TABLE 1 - Biocide Comparison Test - Biocide concentration required for >10$_5$ reduction in variable cell counts in 60 seconds. (milligrams/liters)

Biocide	*Active Ingredient (ppm)*	*P. aeruginosa*	*S. aureus*	*S. cerevisiae*	*E. coli O157:H7*
Oxine	Chlorine Dioxide 20,000	5	30	30	3
Alcide-LD	Sodium Chlorite 27,300 (contains surfactant)	1,300	310	640	
Chlorine	Sodium Hypochlorite 52,500	200	200	400	600
C-13	Sodium Hypochlorite 85,000	820	820	1,600	
Iodophor	Complex-Bound Iodine 180,500 (titratable iodine 17,500 pp	440	440	450	
Wavicide-01	Glutaraldehyde 20,000 unactivated, contains surfactant	2,300	1,200	620	
Sporocidin	Glutaraldehyde activated 20,000	1,600	2,200	18,000	
H2O2	Hydrogen Peroxide 300,000	36,000	68,000	270,000	
Quat	Quaternary Ammonium Compounds 22,500 Octyldecyldimethylammonium Chloride 11,250 Didecyldimethylammonium Chloride 11,250 Diotyldimethylammonium Chloride 30,000 Aklydimethylbenzylammonium Chloride	580	140	74	
Acidified Quat	Acidified Quat + Phosphoric Acid	150	1,200	300	
Amphyl	Phenolic Compounds o-phenylphenol 105,000 o-benxyl-p-chlorophenol	1,500	380	190	
Peroxy Compound I	Peracetic Acid & Hydrogen Peroxide	30	60	300	20
Peroxy Compound II	Peracetic Acid, Hydrogen Peroxide & Acetic Acid	20	40	400	15
Acid Anionic Comp I	Dodecylbenzenesulfonic Acid and Phosphoric Acid	40	80	600	90
Acid Anionic Comp II	Octanoic Acid, Decanoic Acid, Citric Acid & Phosphoric Ac	80	150	200	60