

# DAKIN'S WOUND CLEANSER

WITH SODIUM HYPOCHLORITE AS SOLUTION PRESERVATIVE



**Kills MRSA & VRE in 30 seconds**

**Proven to be Safe and Cost-effective**

**Same formulation as Di-Dak-Sol**

**Non-irritating, Non-cytotoxic,  
Non-sensitizing\***

**No Antibiotics, No Alcohol,  
No Steroids**

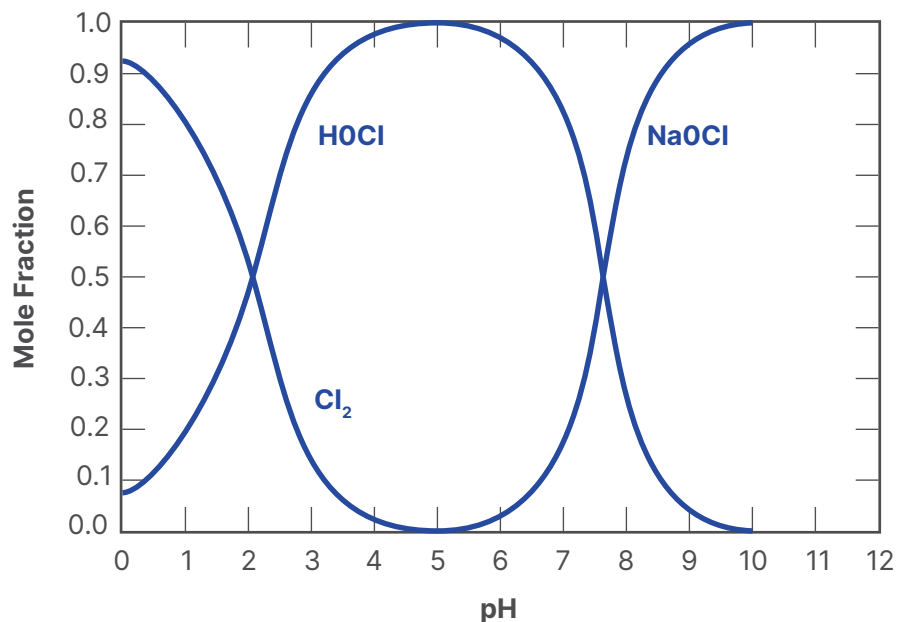
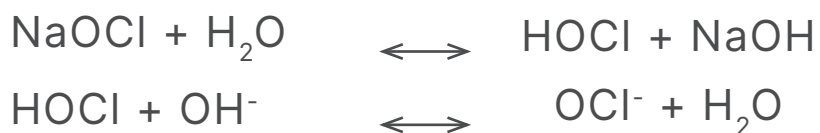
**No rinse formula**

*\* The product has passed the following tests, conducted by independent third party laboratories: sensitization, cytotoxicity, acute eye irritation, acute oral toxicity, acute inhalation toxicity, and primary skin irritation test.*



# Mechanism of Actions

Sodium hypochlorite (NaOCl) is a sodium salt of hypochlorous acid (HOCl). In solution, sodium hypochlorite dissociates to hypochlorous acid and sodium hydroxide. This chemical equation shows an equilibrium sign because the chemical equation can progress to either sodium hypochlorite or hypochlorous acid depending upon the pH of the solution.



As the pH decreases, the ratio of hypochlorous acid to sodium hypochlorite increases. At a pH range of 1 – 2, chlorine gas (Cl<sub>2</sub>) is the predominant chlorine species, at a pH range of 3 – 7 hypochlorous acid (HOCl) is predominant, and at a pH > 8, sodium hypochlorite (NaOCl) is the major species present as shown in the graph.

In general, hypochlorous acid is a weak and unstable acid, existing only in solution. Hypochlorous acid is an unstable strong oxidizing agent because the chlorine molecule is lightly bound and therefore reacts easily. Sodium salt of hypochlorous acid or sodium hypochlorite is typically in alkali or base form, which is more stable. In any hypochlorite solution including sodium hypochlorite and hypochlorous acid, the active moiety is the same.



# Advantages of using Dakin's Wound Cleanser

(Sodium Hypochlorite as solution preservative)

## Antibiotic Drug Resistance

It's well known that infectious diseases caused by antibiotic-resistant bacteria have become an increasingly serious public health problem. Diseases that were formerly curable, such as tuberculosis, gonorrhea, typhoid, and malaria have become resistant or more difficult to treat with antibiotic drugs.

**Public health experts state that the emergence of these resistant bacteria is attributable to the misuse and overuse of antibiotic drugs.**

More and more drug resistant bacteria were isolated from infected wounds. Among these resistant bacteria, the most well-known are MRSA (Methicillin Resistant Staphylococcus aureus) and VRE (Vancomycin Resistant Enterococcus faecalis).

The increasing number/type of wound infection caused by resistant microorganisms results in greatly limited choice of antibiotic to be used in wound management.

Century hired multiple independent third party laboratories to perform antimicrobial effectiveness tests, using the USP method, on our Dakin's Wound Cleanser product. Dakin's Wound Cleanser is the lowest concentration of Dakin's products, containing sodium hypochlorite solution 0.0125%.

**The results showed that Dakin's Wound Cleanser (Sodium Hypochlorite 0.0125% Solution) was effective against a variety of microorganisms including bacteria, viruses, yeasts, molds, and resistant microorganisms.**

The resistant microorganisms that were tested include the most famous wound resistant bacteria, namely MRSA (Methicillin Resistant Staphylococcus aureus) and VRE (Vancomycin Resistant Enterococcus faecalis).

These resistant bacteria, MRSA and VRE, at the initial concentration of  $1.8 \times 10^7$  or higher, were killed after exposure to Dakin's Wound Cleanser for only 30 seconds.

**The percent reduction or "percent kill" of MRSA and VRE, the resistant bacteria, was at least 99.99999% after 30 seconds exposure to WoundClenz.**

WoundClenz is Sodium Hypochlorite 0.0125% Topical Solution, the lowest concentration of Dakin's products manufactured by Century Pharmaceuticals, Inc.

This is the worst case scenario. the higher concentration of our Dakin's products, namely Dakin's Full Strength, Dakin's Half Strength, and Dakin's Quarter Strength are also effective against variety of micro-organisms including bacteria, virus, yeast, mold, and resistant microorganisms.

# Cost Effectiveness for using in Chronic and Complex Wounds

According to Kalorama Information, global sales for the chronic and complex wound market sector were over \$20 billion in 2014. With the growing aging population and people with diabetes, the cost of expenditures for chronic and complex wounds are projected to rise dramatically.

The cost of using Dakin's Wound Cleanser to treat infected wounds is much lower than most other wound care treatments. Healthcare and wound care professionals continue to recognize the cost effectiveness of using Sodium Hypochlorite Topical Solutions to treat infected wounds especially chronic and complex wounds.



On December 22, 2013, USA Today reported a story entitled "Soldier Blown Apart by War Stages Stirring Comeback. Family, Army doctors witness medical miracle". In one part of the story it mentioned persistent fungal infection among wounded soldiers causes multiple amputations and even lives of soldiers.

The story continued to mention the successful use of Dakin's Solution (Sodium Hypochlorite Solution) when applied directly to wounds to stop infection, particularly after many other medications had failed.

Antiseptic topical solutions containing Sodium Hypochlorite are safe and have been widely used since World War I for antiseptic purposes; including the treatment of traumatic or chronic wounds, burns, skin grafts, pressure ulcers, as well as diabetic leg and foot ulcers.

Sodium Hypochlorite solution also been used as an antiseptic to prevent infection in pre- and post- operative patients, in dialysis patients, and in endodontic irrigation patients.

The safety and efficacy of Sodium Hypochlorite Topical Solutions have long been recognized among pharmacists, physicians, nurses and wound care professionals.

## **References:**

- Gregg Zoroya. *Soldier Blown Apart by War Stages Stirring Comeback. Family, Army doctors witness medical miracle. USA Today for The Indianapolis Star, Monday December 23, 2013.*
- Alice Barsoumian, Carlos J. Sanchez, Katrin Mende, Charla C. Tully, Miriam L. Beckius, Kevin S. Akers, Joseph C. Wenke, Clinton K. Murray. *In Vitro Toxicity and Activity of Dakin's Solution, Mafenide Acetate, and Amphotericin B on Filamentous Fungi and Human Cells. J Orthop Trauma, 2013; 27 (8): 428-436.*
- Louis Lewandowski, Richard Purcell, Mark Fleming, Wade T. Gordon. *The Use of Dilute Dakin's Solution for the Treatment of Angioinvasive Fungal Infection in the Combat Wounded: A Case Series. Military Medicine, 2013; 178 (4): e503-e507.*

# Effectiveness of Dakin's Wound Cleanser by Century Pharmaceuticals, Inc.

(Sodium hypochlorite solution 0.0125%) against microorganisms

Microorganism Tested	% Reduction (or % Kill)
Acinetobacter baumannii 020411-3	99.99999
Aspergillus niger ATCC 16404	99.9999
Bacteroides fragilis ATCC 25285	99.99999
Candida albicans ATCC 10231	99.9999
Clostridium difficile ATC C 9689	99.9
Corynebacterium amycolatum ATCC700206	99.999
Enterobacter aerogenes 022411-2	99.9999
Enterobacter faecium ATCC 19434	99.999999
Erysipelothrix rhusiopathiae ATCC 19414	99.999999
Escherichia coli ATCC 11775	99.999999
Haemophilus influenzae ATCC 49766	99.99999
Klebsiella oxytoca 061611-1	99.999999
Klebsiella pneumonia 071912-3	99.99999
Micrococcus luteus 020610-5	99.999999
MRSA ATCC BAA-38	99.999999

Microorganism Tested	% Reduction (or % Kill)
Mycobacteria marinum BAA-535	99.99999
Mycoplasma pneumonia ATCC 29343	99.9999
Propionibacterium acnes ATCC 11827	99.999999
Proteus mirabilis ATCC 14153	99.999999
Pseudomonas aeruginosa ATCC 9027	99.999999
Serratia marcescens ATCC 13477	99.999999
Staphylococcus aureus 080510-7	99.999999
Staphylococcus epidermidis 111611-1	99.99999
Staphylococcus haemolyticus ATCC 29970	99.99999
Streptococcus agalactiae ATCC 12386	99.99999
Streptococcus mutans ATCC 35668	99.999999
Streptococcus pyogenes 031210-7	99.999999
Vibrio vulnificus ATCC 27562	99.9999
VRE ATCC 700221	99.99999



**Century**  
Pharmaceuticals, Inc.

Century Pharmaceuticals, Inc. has been in business since 1966 with the mission to provide the best products and services (primarily pharmaceuticals, medical devices and food chemicals) for our customers, while consistently emphasizing high quality at a reasonable price, returning a reasonable profit to stockholders, and providing a desirable working environment for employees.

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