ZEPHIRAN®

(benzalkonium chloride)

ANTISEPTIC

AQUEOUS SOLUTION 1:750

DESCRIPTION

ZEPHIRAN, brand of benzalkonium chloride, NF, a mixture of alkylbenzyldimethylammonium chlorides, is a cationic quaternary ammonium surface-acting agent. It is very soluble in water, alcohol, and acetone. ZEPHIRAN is supplied as a 1:750 aqueous solution, further dilution may be appropriate depending upon usage (see **RECOMMENDED DILUTIONS**.) Aqueous solutions of ZEPHIRAN are neutral to slightly alkaline, generally colorless, and nonstaining. They have a bitter taste, aromatic odor, and foam when shaken.

CLINICAL PHARMACOLOGY

ZEPHIRAN solutions are rapidly acting anti-infective agents with a moderately long duration of action. They are active against bacteria and some viruses, fungi, and protozoa. Bacterial spores are considered to be resistant. Solutions are bacteriostatic or bactericidal according to their concentration. The exact mechanism of bactericidal action is unknown but is thought to be due to enzyme inactivation. Activity generally increases with increasing temperature and pH. Gram-positive bacteria are more susceptible than gram-negative bacteria (Table 1).

TABLE 1

Highest Dilution of ZEPHIRAN Aqueous Solutions Destroying the Organism in 10 minutes but not in 5 minutes

Organisms	**20° C**
Streptococcus pyogenes	*1:75,000*
Staphylococcus aureus	*1:52,500*
Salmonella typhosa	*1:37,500*
Escherichia coli	*1:10,500*

Pseudomonas is the most resistant gram-negative genus. Using the AOAC Use-Dilution Confirmation Method, no growth was obtained when *Staphylococcus aureus*, *Salmonella choleraesuis*, and *Pseudomonas aeruginosa* (strain PRD-10) were exposed for ten minutes at 20° C to ZEPHIRAN Aqueous Solution 1:750.

ZEPHIRAN Aqueous Solution 1:750 has been shown to retain its bactericidal activity following autoclaving for 30 minutes at 15 lb pressure, freezing, and then thawing.

The tubercle bacillus may be resistant to ZEPHIRAN solutions.

ZEPHIRAN solutions also demonstrate deodorant, wetting, detergent, keratolytic, and emulsifying activity.

INDICATIONS AND USAGE

ZEPHIRAN solutions in appropriate dilutions (see **RECOMMENDED DILUTIONS**) are indicated for the antisepsis of skin, mucous membranes, and wounds. They are used for preoperative preparation of the skin, surgeons' hand and arm soaks, treatment of wounds, preservation of ophthalmic solutions, irrigations of the eye, body cavities, bladder, urethra, and vaginal douching.

CONTRAINDICATION

The use of ZEPHIRAN solutions in occlusive dressings, casts, and anal or vaginal packs is inadvisable, as they may produce irritation or chemical burns.

WARNINGS

Sterile Water for Injection, USP, should be used as diluent in preparing diluted aqueous solutions intended for use on deep wounds or for irrigation of body cavities. Otherwise, freshly distilled water should be used. Tap water, containing metallic ions and organic matter, may reduce antibacterial potency. Resin deionized water should not be used since it may contain pathogenic bacteria.

Organic, inorganic, and synthetic materials and surfaces may adsorb sufficient quantities of ZEPHIRAN to significantly reduce its antibacterial potency in solutions. This has resulted in serious contamination of ZEPHIRAN solutions with viable pathogenic bacteria. Solutions should not be stored in bottles stoppered with cork closures, but rather in those equipped with appropriate screw-caps. Cotton, wool, rayon, and other materials should not be stored in ZEPHIRAN solutions. Gauze sponges and fiber pledgets used to apply solutions of ZEPHIRAN to the skin should be sterilized and stored in separate containers. Only immediately prior to application should they be immersed in ZEPHIRAN solutions.

Since ZEPHIRAN solutions are inactivated by soaps and anionic detergents, thorough rinsing is necessary if these agents are employed prior to their use.

Antiseptics such as ZEPHIRAN solutions must not be relied upon to achieve complete sterilization, because they do not destroy bacterial spores and certain viruses, including the

etiologic agent of infectious hepatitis, and may not destroy Mycobacterium tuberculosis and other rare bacterial strains.

If solutions stronger than 1:3000 enter the eyes, irrigate immediately and repeatedly with water. Prompt medical attention should then be obtained. Concentrations greater than 1:5000 should not be used on mucous membranes, with the exception of the vaginal mucosa (see **RECOMMENDED DILUTIONS**).

PRECAUTIONS

In preoperative antisepsis of the skin, ZEPHIRAN solutions should not be permitted to remain in prolonged contact with the patient's skin. Avoid pooling of the solution on the operating table.

ZEPHIRAN solutions that are used on inflamed or irritated tissues must be more dilute than those used on normal tissues (see **RECOMMENDED DILUTIONS**).

ZEPHIRAN solutions used in skin preparation have a tendency to "run off" the skin. It may be preferable to use alternately with alcohol in preoperative preparation of the skin. (See **DIRECTIONS FOR USE**).

Preoperative periorbital skin or head prep should be performed only before the patient, or eye, is anesthetized.

ADVERSE REACTIONS

ZEPHIRAN solutions in normally used concentrations have low systemic and local toxicity and are generally well tolerated, although a rare individual may exhibit hypersensitivity.

DIRECTIONS FOR USE

General: Liberal use of the solution is recommended to compensate for any adsorption of ZEPHIRAN by cotton or other materials.

Preoperative preparation of skin: ZEPHIRAN solutions 1:750 is recommended as an antiseptic for use on unbroken skin in the preoperative preparation of the surgical field. Detergents and soaps should be thoroughly rinsed from the skin before applying ZEPHIRAN solutions. The detergent action of ZEPHIRAN solutions, particularly when used alternately with alcohol, leaves the skin smooth and clean. When ZEPHIRAN solutions are applied by friction (using several changes of sponges), dirt, skin fats, desquamating epithelium, and superficial

bacteria are effectively removed, thus exposing the underlying skin to the antiseptic activity of the solutions.

RECOMMENDED DILUTIONS

For specific directions, see TABLES 2 and 3.

Surgery

Preoperative preparation of skin:

Aqueous solution 1:750

Surgeons' hand and arm soaks:

Aqueous solution 1:750

Irrigation of deep infected wounds:

Aqueous solution 1:3000 to 1:20,000

Denuded skin and mucous membranes:

Aqueous solution 1:5000 to 1:10,000

Obstetrics and Gynecology

Preoperative preparation of skin:

Aqueous solution 1:750

Vaginal douche and irrigation:

Aqueous solution 1:2000 to 1:5000

Postepisiotomy care:

Aqueous solution 1:5000 to 1:10,000

Breast and nipple hygiene:

Aqueous solution 1:1000 to 1:2000

Urology

Bladder and urethral irrigation:

Aqueous solution 1:5000 to 1:20,000

Bladder retention lavage:

Aqueous solution 1:20,000 to 1:40,000

Dermatology

Oozing and open infections:

Aqueous solution 1:2000 to 1:5000

Wet dressings by irrigation or open dressing

(Use in occlusive dressings is inadvisable.):

Aqueous solution 1:5000 or less

Ophthalmology

Eye irrigation:

Aqueous solution 1:5000 to 1:10,000

Preservation of ophthalmic solutions:

Aqueous solution 1:5000 to 1:7500

ACCIDENTAL INGESTION

If ZEPHIRAN solution, particularly a concentrated solution, is ingested, marked local irritation of the gastrointestinal tract, manifested by nausea and vomiting, may occur. Signs of systemic toxicity include restlessness, apprehension, weakness, confusion, dyspnea, cyanosis, collapse, convulsions, and coma. Death occurs as a result of paralysis of the respiratory muscles.

Treatment: Immediate administration of several glasses of a mild soap solution, milk, or egg whites beaten in water is recommended. This may be followed by gastric lavage with a mild soap solution. Alcohol should be avoided as it promotes absorption.

To support respiration, the airway should be clear and oxygen should be administered, employing artificial respiration if necessary. If convulsions occur, a short-acting barbiturate may be given parenterally with caution.

TABLE 2
Correct Use of ZEPHIRAN

ZEPHIRAN solutions must be prepared, stored and used correctly to achieve and maintain their antiseptic action. Serious inactivation and contamination of ZEPHIRAN solutions may occur with misuse.

CORRECT DILUENT	INCOMPATIBILITIES

Sterile Water for Injection is recommended for irrigation of body cavities.

Sterile distilled water is recommended for irrigating traumatized tissue and in the eye.

Resin deionized water should not be used because the deionizing resins can carry pathogens (especially gram-negative bacteria): they also inactivate quaternary ammonium compounds.

Stored water is not recommended since it may contain many organisms.

Saline should not be used since it may decrease the antibacterial potency of ZEPHIRAN solutions.

Anionic detergents and soaps should be thoroughly rinsed from the skin or other areas prior to use of ZEPHIRAN because they reduce its antibacterial activity.

Serum and protein material also decrease the activity of ZEPHIRAN.

Corks should not be used to stopper bottles containing ZEPHIRAN solutions.

Fibers or fabrics adsorb ZEPHIRAN.

Examples are:

Cotton
Gauze sponges
Wool
Rayon
Rubber materials

Applicators or sponges, intended for a skin prep, should be stored separately and dipped in ZEPHIRAN solutions immediately before use.

Under certain circumstances the following commonly encountered substances are incompatible with ZEPHIRAN solutions:

Iodine
Silver nitrate
Fluorescein
Nitrates
Peroxide
Lanolin
Potassium permanganate
Aluminum
Caramel
Kaolin
Pine oil
Zinc sulfate
Zinc oxide
Yellow oxide of mercury

TABLE 3
Dilutions of ZEPHIRAN Aqueous Solution 1:750

Final Dilution	ZEPHIRAN Aqueous Solution 1:750 (parts)	Sterile Water for Injection or Sterile Distilled Water (parts)
1:1000	3	1
1:2000	3	5
1:2500	3	7
1:3000	3	9
1:4000	3	13

1:5000	3	17
1:10,000	3	37
1:20,000	3	77
1:40,000	3	157

HOW SUPPLIED

ZEPHIRAN Aqueous Solution 1:750

Bottles of 8 fl oz (NDC 0024-2521-04)

1 gallon bottles (NDC 0024-2521-08)

Store at 25° C (77° F); excursions permitted to 15°-30°C (59° - 86° F) [see USP Controlled Room Temperature]

Manufactured for:
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