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3,584,128

ANTIBACTERIAL COMPOSITION

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ABSTRACT OF THE DISCLOSURE

Antibacterial composition containing a 1:1 ratio of a combination of 3 - chlorodibenz(be)(1,4)oxiodinium chloride and a mixture of 3,4,4'-trichlorocarbanilide, 3-trifluoromethyl - 4,4'-dichlorocarbanilide, 3,4',5 - tribromosalicylanilide in an 1:1:1 ratio.

BACKGROUND OF THE INVENTION

This invention relates to improved antibacterial compositions. More particularly, it relates to antibacterial agents which comprise in combination specific dibenzoxiodinium compounds and an additional antibacterial agent selected from the group consisting of 3,4,4'-trichlorocarbanilide, 3 - trifluoromethyl-4,4'-dichlorocarbanilide, 3,4',5-tribromosalicylanilide, bis(2 - hydroxy - 3,5,6 - trichlorophenyl)methane and combinations of these agents in special and essential proportions. These agents exhibit enhanced antibacterial activity, especially when incorporated into a soap or detergent formulation.

The application of the above compounds as antibacterial agents individually and in certain specific combinations have been disclosed in the art. See for example, U.S. Pats. 2,745,874; 3,084,097; 3,134,711; 3,244,636, etc. For example they have been successfully employed as antibacterial agents in detergent compositions, such as deodorant toilet bars and granular detergent compositions, oral hygienic preparations, including tothpastes and mouthwashes, and in various cosmetic formulations.

While the antibacterial agents which have heretofore been employed in detergent compositions, including the above compounds, have been quite effective, further improvements in efficacy for such applications would be desirable.

It is an object of this invention to provide a composition having a high level of antibacterial activity.

It is a further object of this invention to provide an antibacterial composition which is effective against both Gram-positive and Gram-negative bacteria.

It is a still further object of this invention to provide an antibacterial composition which is adapted to use in detergent milieu.

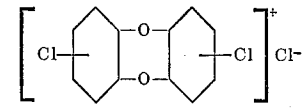
Other objects, improvements and advantages of the present invention will be readily apparent to one skilled in the art from the following detailed description.

SUMMARY OF THE INVENTION

These objects are achieved by the present invention which is directed towards synergistic combinations of specific chlorodibenzoxiodinium compounds and at least one compound selected from the group consisting of 3,4,4'-trichlorocarbanilide, 3-trifluoromethyl - 4,4' - dichlorocarbanilide, 3,4',5 - tribromosalicylanilide and bis-(2-hydroxy-3,5,6 - trichlorophenyl)methane. "Synergistic combination" as used herein refers to a mixture of two or more discrete agencies which display a degree of antibacterial activity which is greater than the sum of the antibacterial activity of the agents taken independently. The synergistic combinations of the present invention have

special and essential ratios of their components as hereinafter specifically defined.

The specific dibenzoxiodinium antibacterial compounds useful in the present invention have the following general structure:

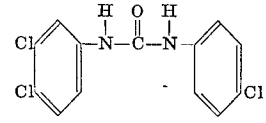


The three specific dibenzoxiodinium compounds useful in the present invention are as follows:

1-chlorodibenz(be)(1,4)oxiodinium chloride,
2-chlorodibenz(be)(1,4)oxiodinium chloride, and
3-chlorodibenz(be)(1,4)oxiodinium chloride.

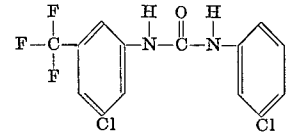
The precise method by which any of these compounds can be prepared constitutes no part of this invention. Several alternate methods are available for the preparation of the chlorodibenzoxiodinium compounds of the present invention. Some of these methods and other methods are described in U.S. Pat. 3,244,636 issued Apr. 5, 1966 to Reller et al. which is incorporated herein by reference.

The 3,4,4'-trichlorocarbanilide useful in the present invention has the following structure:



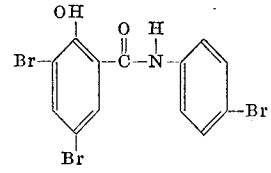
This chlorocarbanilide and other similar halogenated carbanilides are more fully described in U.S. Pat. 2,846,398, as are various methods of preparation.

The 3-trifluoromethyl-4,4'-dichlorocarbanilide useful in the present invention has the following structure:



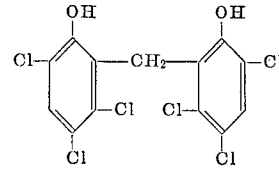
This trifluoromethyldiphenyl urea compound and other similar trifluoromethyldiphenyl urea compounds are more fully described in U.S. Pat. 2,745,874. This patent further discloses a method for their preparation.

The 3,4'(5-tribromosalicylanilide useful in the present invention has the following structure:



This halogenated salicylanilide is disclosed in U.S. Pat. 2,906,711. Other salicylanilides are disclosed in U.S. Pat. 2,703,332; this patent further discloses a method for their preparation.

The bis(2-hydroxy - 3,5,6 - trichlorophenyl)methane useful in the present invention has the following structure:



This halogenated bisphenol is also known as hexachlorophene and is well documented in the patent literature, e.g., see U.S. Pat. 2,535,077.

The following combinations of antibacterial agents are the compositions of the present invention which exhibit synergistic effects:

	Ratio of parts	
1-chlorodibenz(be)(1,4)oxiodinium chloride ---	1	2
3,4,4'-trichlorocarbanilide ----------	1	1
1-chlorodibenz(be)(1,4)oxiodinium chloride ---	1	2
3-trifluoromethyl-4,4'-dichlorocarbanilide ------	1	1
1-chlorodibenz(be)(1,4)oxiodinium chloride ---	1	1
3,4',5-tribromosalicylanilide ----------	1	2
1-chlorodibenz(be)(1,4)oxiodinium chloride ---	2	
Bis(2-hydroxy-3,5,6-trichlorophenyl)methane --	1	
1-chlorodibenz(be)(1,4)oxiodinium chloride ---	1	1
And in a 1:1:1 ratio a mixture of 3,4,4'-trichlorocarbanilide, 3 - trifluoromethyl-4,4'-dichlorocarbanilide, 3,4',5 - tribromosalicylanilide --	1	2
2-chlorodibenz(be)(1,4)oxiodinium chloride ---	1	
3,4,4'-trichlorocarbanilide ----------	1	
2-chlorodibenz(be)(1,4)oxiodinium chloride ---	2	
3-trifluoromethyl-4,4'-dichlorocarbanilide ------	1	
2-chlorodibenz(be)(1,4)oxiodinium chloride ---	2	
3,4',5-tribromosalicylanilide ----------	1	
2-chlorodibenz(be)(1,4)oxiodinium chloride ---	2	
Bis(2-hydroxy-3,5,6-trichlorophenyl)methane --	1	
2-chlorodibenz(be)(1,4)oxiodinium chloride ---		1
And in a 1:1:1 ratio a mixture of 3,4,4'-trichlorocarbanilide, 3 - trifluoromethyl-4,4'-dichlorocarbanilide, 3,4',5-tribromosalicylanilide -----		1
3-chlorodibenze(be)(1,4)oxiodinium chloride --		1
And in a 1:1:1 ratio a mixture of 3,4,4'-trichlorocarbanilide, 3 - trifluoromethyl-4,4'-chlorocarbanilide, 3,4',5-tribromosalicylanilide ----		1

It has been found that the above listed combinations of antibacterial agents possess synergistic antibacterial properties whereby a lasting antibacterial effect is obtained particularly when used in a soap and non-soap synthetic detergent compositions and other products where an antibacterial action is desired. Detergent compositions containing from about 1% to about 5%, preferably about 3% are particularly effective.

The term "soap" as used herein is meant to designate alkali metal soaps such as the sodium and potassium salts of the higher fatty acids of naturally occurring plant or animal esters, e.g., palm oil, coconut oil, babassu oil, soybean oil, castor oil, tallow, whale and fish oils, grease and lard and mixtures thereof. Sodium and potassium soaps can be made by direct saponification of the fats and oils or by the neutralization of the fatty acids which are prepared in a separate manufacturing process. Examples of suitable soaps are the sodium, potassium, ammonium and alkylolammonium salts of higher fatty acids (C_{10}–C_{20}). Particularly useful are the sodium and potassium salts of the mixtures of fatty acids derived from coconut oil and tallow, i.e., sodium or potassium tallow and coconut soap.

Anionic synthetic detergents which can be used with the antibacterial combinations of the present invention can be broadly defined as the water-soluble salts, including the alkali metal, ammonium and substituted ammonium salts, of organic sulfuric reaction products having in their molecular structure an alkyl radical containing from about 8 to about 22 carbon atoms and a radical selected from the group consisting of sulfonic acid and sulfuric acid ester radicals.

Important examples of the synthetic detergents which can be used with the compositions of the present invention are the following: as alkali metal (e.g., sodium and potassium) ammonium and substituted ammonium (e.g., lower alkyl ammonium) salts; alkyl sulfates, especially those obtained by sulfating the higher alcohols produced by reducing the glycerides of tallow or coconut oil; random paraffin sulfonates, in which the alkyl group contains

from about 8 to about 22 carbon atoms, prepared by treating random paraffin hydrocarbons in sulfur dioxide and chlorine in the presence of light followed by treating with a base; branched or linear alkyl benzene sulfonates, in which the alkyl group contains from about 8 to about 18 carbon atoms, preferably from about 10 to about 14 carbon atoms, especially those of the types described in U.S. Pat. Nos. 2,220,099, and 2,477,383; sodium alkyl glyceryl ether sulfonates, especially those ethers of the higher alcohols derived from tallow and coconut oil; coconut oil fatty acid monoglyceride sulfates and sulfonates; sulfuric acid esters of the reaction product of one mole of a higher fatty alcohol (e.g., tallow or coconut alcohols) and from about 1 to about 6, preferably about 3 moles of ethylene oxide; alkyl phenol ethylene oxide ether sulfates with about 4 units of ethylene oxide per molecule and in which the alkyl radicals contain about 9 carbon atoms; the reaction product of fatty acids esterified with isethionic acid and neutralized with sodium hydroxide where, for example, the fatty acids are derived from coconut oil; fatty acid amides of the methyl taurine in which the fatty acids, for example, are derived from coconut oil; sulfonated olefins of U.S. Pat. No. 3,332,880; and others known in the art, a number being specifically set forth in U.S. Pat. Nos. 2,486,921; 2,486,922 and 2,396,278.

The nonionic synthetic detergents which can be used with the antibacterial combinations of the present invention may be broadly defined as compounds produced by the condensation of alkylene oxide groups (hydrophilic in nature) with an organic hydrophobic compound which may be aliphatic or alkyl-aromatic in nature. The length of the hydrophilic or polyoxyalkylene radical which is condensed with any particular hydrophobic group can be readily adjusted to yield a water-soluble compound having the desired degree of balance between hydrophilic and hydrophobic elements.

For example, a well known class of nonionic synthetic detergents is made available on the market under the trade name of "Pluronic." These compounds are formed by condensing ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. The hydrophobic portion of the molecule which, of course, exhibits water insolubility has a molecular weight of from about 1500 to 1800. The addition of polyoxyethylene radicals to this hydrophobic portion tends to increase the water solubility of the molecule as a whole and the liquid character of the products is retained up to the point where polyoxyethylene content is about 50% of the total weight of the condensation product.

Other suitable nonionic synthetic detergents include:

(1) The polyethylene oxide condensates of alkyl phenols, e.g., the condensation products of alkyl phenols having an alkyl group containing from about 6 to 12 carbon atoms in either a straight chain or branched chain configuration, with ethylene oxide, the said ethylene oxide being present in amounts equal to 10 to 25 moles of ethylene oxide per mole of alkyl phenol. The alkyl substituent in such compounds may be derived from polymerized propylene, diisobutylene, octane, or nonane, for example.

(2) Those derived from the condensation of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylene diamine—products which may be varied in composition depending upon the balance between the hydrophobic and hydrophilic elements which is desired. For example, compounds containing from about 40% to about 80% polyoxyethylene by weight and having a molecular weight of from about 5000 to about 11,000 resulting from the reaction of ethylene oxide groups with a hydrophobic base constituted of the reaction product of ethylene diamine and excess propylene oxide, said base having a molecular weight of the order of 2500 to 3000, are satisfactory.

(3) The condensation product of aliphatic alcohols having from 8 to 18 carbon atoms, in either straight chain or branched chain configuration, with ethylene oxide, e.g., a coconut alcohol ethylene oxide condensate having from 10 to 30 moles of ethylene oxide per mole of coconut alcohol, the coconut alcohol fraction having from 10 to 14 carbon atoms.

(4) Long chain tertiary amine oxides corresponding to the following general formula, $R_1R_2R_3N\rightarrow O$, wherein R_1 contains an alkyl, alkenyl or monohydroxy alkyl radical of from about 8 to about 18 carbon atoms from 0 to about 10 ethylene oxide moieties, and from 0 to 1 glyceryl moiety, and R_2 and R_3 contain from 1 to about 3 carbon atoms and from 0 to about 1 hydroxy group, e.g., methyl, ethyl, propyl, hydroxy ethyl, or hydroxy propyl radicals. The arrow in the formula is a conventional representation of a semi-polar bond. Examples of amine oxides suitable for use in this invention include dimethyldodecylamine oxide, oleyldi(2-hydroxyethyl)amine oxide, dimethyloctylamine oxide, dimethyldecylamine oxide, dimethyltetradecylamine oxide, 3,6,9-trioxaheptadecyldiethylamine oxide, di(2-hydroxyethyl)tetradecylamine oxide, 2-dodecoxyethyldimethylamine oxide, 3-dodecoxy-2-hydroxypropyl-di(3-hydroxypropyl)amine oxide, dimethylhexadecylamine oxide.

(5) Long chain tertiary phosphine oxides corresponding to the following general formula $RR'R''P\rightarrow O$, wherein R contains an alkyl, alkenyl or monohydroxyalkyl radical ranging from 8 to 18 carbon atoms in chain length, from 0 to about 10 ethylene oxide moieties and from 0 to 1 glyceryl moiety and R' and R'' are each alkyl or monohydroxyalkyl groups containing from 1 to 3 carbon atoms. The arrow in the formula is a conventional representation of a semi-polar bond. Examples of suitable phosphine oxides are:

dodecyldimethylphosphine oxide
tetradecyldimethylphosphine oxide
tetradecylmethylethylphosphine oxide
3,6,9-trioxaoctadecyldimethylphosphine oxide
cetyldimethylphosphine oxide
3-dodecoxy-2-hydroxypropyldi(2-hydroxyethyl)phosphine oxide
stearyldimethylphosphine oxide
cetylethylpropylphosphine oxide
oleyldiethylphosphine oxide
dodecyldiethylphosphine oxide
tetradecyldiethylphosphine oxide
dodecyldipropylphosphine oxide
dodecyldi(hydroxymethyl)phosphine oxide
dodecyldi(2-hydroxyethyl)phosphine oxide
tetradecylmethyl-2-hydroxypropylphosphine oxide
oleyldimethylphosphine oxide
2-hydroxydodecyldimethylphosphine oxide.

(6) Long chain dialkyl sulfoxides containing one short chain alkyl or hydroxy alkyl radical of 1 to about 3 carbon atoms (usually methyl) and one long hydrophobic chain which contains alkyl, alkenyl, hydroxy alkyl, or keto alkyl radicals containing from about 8 to about 20 carbon atoms, from 0 to about 10 ethylene oxide moieties and from 0 to 1 glyceryl moiety. Examples include:

octadecyl methyl sulfoxide, 2-ketotridecyl methyl sulfoxide
3,6,9-trioxaoctadecyl 2-hydroxyethyl sulfoxide
dodecyl methyl sulfoxide
oleyl 3-hydroxy propyl sulfoxide
tetradecyl methyl sulfoxide
3-methoxytridecyl methyl sulfoxide
3-hydroxytridecyl methyl sulfoxide
3-hydroxy-4-dodecoxybutyl methyl sulfoxide

The zwitterionic synthetic detergents useful with the antibacterial agents of the present invention can be broadly described as derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds, in which the aliphatic radicals can be straight chain or branched, and wherein one of the aliphatic substituents contains from about 8 to 18 carbon atoms and one contains an anionic water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. A general formula for these compounds is:

$$R_2-\overset{(R^3)_x}{\underset{|}{Y^{(+)}}}-CH_2-R^4-Z^{(-)}$$

wherein R^2 contains an alkyl, alkenyl, or hydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties and from 0 to 1 glyceryl moiety; Y is selected from the group consisting of nitrogen, phosphorus, and sulfur atoms; R^3 is an alkyl or monohydroxyalkyl group containing 1 to about 3 carbon atoms; x is 1 when Y is a sulfur atom and 2 when Y is a nitrogen or phosphorous atom, R^4 is an alkylene or hydroxyalkylene of from 1 to about 4 carbon atoms and Z is a radical selected from the group consisting of carboxylate, sulfonate, sulfate, phosphonate, and phosphate groups.

Examples include:

4-[N,N-di(2-hydroxyethyl)-N-octadecylammonio]-butane-1-carboxylate;
5-[S-3-hydroxypropyl-S-hexadecylsulfonio]-3-hydroxypentane-1-sulfate;
3-[P,P-diethyl-P-3,6,9-trioxatetracosylphosphonio]-2-hydroxypropane-1-phosphate;
3-[N,N-dipropyl-N-3-dodecoxy-2-hydroxypropylammonio]-propane-1-phosphonate;
3-(N,N-dimethyl-N-hexadecylammonio)propane-1-sulfonate;
3-(N,N-dimethyl-N-hexadecylammonio)-2-hydroxypropane-1-sulfonate;
4-[N,N-di(2-hydroxyethyl)-N-(2-hydroxydodecyl)ammonio]-butane-1-carboxylate;
3-[S-ethyl-S-(3-dodecoxy-2-hydroxypropylsulfonio]-propane-1-phosphate;
3-[P,P-dimethyl-P-dodecylphosphonio]-propane-1-phosphonate; and
5-[N,N-di(3-hydroxypropyl)-N-hexadecylammonio]-2-hydroxypentane-1-sulfate.

The amphoteric synthetic detergents useful in the present invention can be broadly described as derivatives of aliphatic secondary and tertiary amines in which the aliphatic radical can be straight chain or branched and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. Examples of compounds falling within this definition are sodium 3-dodecylaminopropionate, sodium 3-dodecylaminopropane sulfonate, dodecyl-beta-alanine, N-alkyltaurines such as the one prepared by reacting dodecylamine with sodium isethionate according to the teaching of U.S. Pat. No. 2,658,072, N-higher alkyl aspartic acids such as those produced according to the teaching of U.S. Pat. No. 2,438,091, and the products sold under the trade name "Miranol" and described in U.S. Pat. No. 2,528,3787.

Detergent formulations containing the antibacterial compositions of the present invention can also contain from about 0% to about 90%, preferably from about 10% to about 90% of water-soluble alkaline detergency builder salts, either of the organic or inorganic types. Examples of such builder salts can be found in U.S. Pat. No. 3,336,233, issued Aug. 15, 1967, column 9, lines 29–66, which is incorporated herein by reference.

The detergent formulations can also contain any of the usual adjuvants, diluents, and additives, for example, perfumes, anti-tarnishing agents, anti-redeposition agents, dyes, fluorescers, suds builders, suds depressors and the like without detracting from the advantageous properties of the antibacterial compositions of the present invention.

PREFERRED EMBODIMENTS

The antibacterial efficacies of the synergistic combinations of the present invention were established by determining bacteriostasis of the combinations. This is achieved by means of an "Agar Incorporation Test" which consists essentially of preparing serial dilutions of the antibacterial combinations to be tested in trypticase-soy agar, surface inoculating with the chosen test organism and observing the minimum concentration which just prevents growth of the organism throughout incubation. This minimum concentration is called the bacteriostatic breakpoint. In these tests in vitro, the organism *Escherichia coli,* which is a Gram-negative species is utilized.

This test is different from that employed in U.S. Pat. 3,244,636, Reller et al., and reported in Table I therein. The following data should not be interpreted as showing that the oxiodinium chlorides, the "RD–50" and the other antibacterials are not effective against *Escherichia coli.* They are in fact quite effective against *Escherichia coli.* The data show, however, on a parallel and relative basis, that, while the prior art antibacterials are effective *Es*- that, while the prior art antibacterials are effective against *Escherichia coli,* the combinations of this invention are synergistically better in their effectiveness.

In these examples the following abbreviations represent the antibacterial agents indicated:

1–Cl DBOI Cl=1-chlorodibenz(be)(1,4)oxiodinium chloride
2–Cl DBOI Cl=2-chlorodibenz(be)(1,4)oxidinium chloride
3–Cl DBOI Cl=3-chlorodibenz(be)(1,4)oxiodinium chloride
TCC=3,4,4'-trichlorocarbanilide
TFC=3-trifluoromethyl-4,4'-dichlorocarbanilide
BSA=3,4',5-tribromosalicylanilide
G–11=bis(2-hydroxy-3,5,6-trichlorophenyl)methane
RD–50=a mixture in a 1:1:1 ratio of TCC, TFC and BSA

EXAMPLE I

Composition	Compounds	Ratio	Total p.p.m. of antibacterial agents
1	1-Cl DBOI Cl		>12.8
2	RD-50		>12.8
3	1-Cl DBOI-Cl+RD50	1:1	6.4–12.8
4	1-Cl DBOI-Cl+RD50	1:2	6.4–12.8
5	1-Cl DBOI-Cl+RD50	1:4	>12.8
6	2-Cl DBOI-Cl		>12.8
7	2-Cl DBOI-Cl+RD50	1:1	6.4–12.8
8	2-Cl DBOI-Cl+RD50	1:2	>12.8
9	2-Cl DBOI-Cl+RD50	1:4	>12.8
10	3-Cl DBOI-Cl		6.4–12.8
11	3-Cl DBOI-Cl+RD50	1:1	1.6–3.2
12	3-Cl DBOI-Cl+RD50	1:2	6.4–12.8
13	3-Cl DBOI-Cl+RD50	1:4	6.4–12.8
14	TCC		>12.8
15	1-Cl DBOI-Cl+TCC	1:1	6.4–12.8
16	1-Cl DBOI-Cl+TCC	2:1	6.4–12.8
17	1-Cl DBOI-Cl+TCC	1:2	>12.8
18	2-Cl DBOI-Cl+TCC	1:1	6.4–12.8
19	2-Cl DBOI-Cl+TCC	1:2	>12.8
20	2-Cl DBOI-Cl+TCC	2:1	>12.8
21	TFC		>12.8
22	1-Cl DBOI-Cl+TFC	1:1	6.4–12.8
23	1-Cl DBOI-Cl+TFC	2:1	6.4–12.8
24	1-Cl DBOI-Cl+TFC	1:2	>12.8
25	2-Cl DBOI-Cl+TFC	1:1	>12.8
26	2-Cl DBOI-Cl+TFC	2:1	6.4–12.8
27	2-Cl DBOI-Cl+TFC	1:2	>12.8
28	BSA		
29	1-Cl DBOI-Cl+BSA	1:1	6.4–12.8
30	1-Cl DBOI-Cl+BSA	2:1	3.2–6.4
31	1-Cl DBOI-Cl+BSA	1:2	3.2–6.4
32	2-Cl DBOI-Cl+BSA	1:1	>12.8
33	2-Cl DBOI-Cl+BSA	2:1	6.4–12.8
34	2-Cl DBOI-Cl+BSA	1:2	>12.8
35	G-11		
36	1-Cl DBOI-Cl+G-11	1:1	>12.8
37	1-Cl DBOI-Cl+G-11	2:1	6.4–12.8
38	1-Cl DBOI-Cl+G-11	1:2	6.4–12.8
39	2-Cl DBPI-Cl+G-11	1:1	>12.8
40	2-Cl DBOI-Cl+G-11	2:1	6.4–12.8
41	2-Cl DBOI-Cl+G-11	1:2	>12.8

It can readily be seen that synergism is exhibited by the combinations and ratios that are underlined. These antibacterial compositions within their essential ratios can be incorporated into soap and detergent formulations which then exhibit significant and desirable anti-bacterial qualities.

EXAMPLE II

A milled toilet detergent bar is prepared in accordance with methods known and used in the art and having the following composition:

	Percent
Sodium alkyl glyceryl ether sulfonate (alkyl group derived from the middle-cut [1] of alcohols obtained by catalytic reduction of coconut oil)	8.0
Potassium alkyl sulfate (alkyl group derived from the middle-cut [1] of alcohols obtained by catalytic reduction of coconut oil)	20.0
Magnesium soap of 80:20 tallow: coconut fatty acids	17.0
Inorganic salts (sodium and potassium chlorides and sulfates)	32.0
1–Cl DBOI Cl	1.0
TCC	1.0
Water and minors	Balance to 100

[1] Middle-cut coconut alcohols having a chain length distribution substantially as follows: 2% C_{10}, 66% C_{12}, 23% C_{14} and 9% C_{16}.

This bar cleans well and exhibits good odor reducing properties evidencing antibacterial effectiveness. It reduces the number of bacteria on the skin and does not discolor significantly.

When the 1% 1–Cl DBOI Cl and 1% TCC of Example II and inorganic salts, as required, are replaced by the following combinations of antibacterial agents in the essential percentages substantially equivalent results are obtained, i.e., good cleaning and good odor reducing properties.

	Percent
1–Cl DBOI Cl	2
TCC	1
1–Cl DBOI Cl	1
TFC	1
1–Cl DBOI Cl	2
TFC	1
1–Cl DBOI Cl	1
BSA	1
1–Cl DBOI Cl	2
BSA	1
1–Cl DBOI Cl	1
BSA	2
1–Cl DBOI Cl	2
G–11	1
1–Cl DBOI Cl	1
G–11	2
1–Cl DBOI Cl	1
RD–50	1
1–Cl DBOI Cl	1
RD–50	2

EXAMPLE III

A granular built synthetic detergent composition having the following formulation can be prepared and the antibacterial compositions of the present invention can be incorporated therein.

	Percent
Sodium dodecylbenzene sulfonate	17.5
Sodium tripolyphosphate	50.0
Sodium sulfate	14.0
Sodium silicate (SiO_2:Na_2O=2:1)	7.0
2–Cl DBOI Cl	2.0
TFC	1.0
Water and minors	Balance to 100

This composition, in addition to performing well in its cleaning capacity, imparts considerable antibacterial activity to fabrics cleansed in its solution.

When the 2% 2–Cl DBOI Cl and 1% TFC of Example III are replaced by the following combinations of anti-

bacterial agents in essential percentages, substantially equivalent results are obtained, i.e., good cleaning and good odor reducing properties.

	Percent
2-Cl DBOI Cl	1
RD-50	1
2-Cl DBOI Cl	1
TCC	1
2-Cl DBOI Cl	2
BSA	1
2-Cl DBOI Cl	2
G-11	1
3-Cl DBOI Cl	1
RD-50	1

Substantially equivalent results are obtained, i.e., good cleaning and good odor reducing properties when the sodium dodecylbenzene sulfonate of Example III is replaced, on an equal weight basis, by the following:

sodium tallowalkyl sulfate;
potassium coconutalkyl glyceryl ether sulfonate;
sodium salt of randomly sulfonated paraffin containing an average of 15.2 carbon atoms;
ammonium tridecyl sulfate;
condensation product of octyl phenol with 15 moles of ethylene oxide per mole of octyl phenol;
dimethyldodecylamine oxide
dodecyldimethylphosphine oxide;
tetradecyl methyl sulfoxide

3-(N,N-dimethyl-N-hexadecylammonio)propane-1-sulfonate;
3-dodecylaminopropionate; and
dodecyl-beta-alanine.

The invention has been described above in conjunction with toilet and laundry detergents. It will be obvious to those skilled in the art, however, that the antibacterial compositions of the present invention can also be beneficially employed in such products as toothpastes, mouthwashes, cosmetic preparations and the like.

What is claimed is:

1. An antibacterial composition consisting of (a) 3-chlorodibenz(be)(1,4)oxiodinium chloride and in a 1:1:1 ratio, (b) a mixture of 3,4,4'-trichlorocarbanilide, 3-trifluoro-methyl-4,4'-dichlorocarbanilide, 3,4',5 - tribromosalicylanilide, in a ratio of a:b of about 1:1.

References Cited

UNITED STATES PATENTS

3,134,711	5/1964	Reller et al.	424—233
3,256,200	6/1966	Reller et al.	424—233
3,281,366	10/1966	Judge et al.	424—233
3,284,363	11/1966	Bright	424—233
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JEROME D. GOLDBERG, Primary Examiner

U.S. Cl. X.R.

252—106, 107; 424—322, 340

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,584,128 Dated June 8, 1971

Inventor(s) Herbert H. Reller and William E. Jordan

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 40, "tothpastes" should read ---toothpastes---.
Column 2, line 9, "O" should read ---I---.
Column 2, line 48, "3,4'(5-tribromosalicylanilide" should read ---3,4',5-tribromosalicylanilide---.
Column 3, line 32, "3-chlorodibenze(be)(1,4)oxiodinium chloride" should read ---3-chlorodibenz(be)(1,4)oxiodinium chloride---.
Column 3, line 34, "3-trifluoromethyl-4,4'-chloro-" should read ---3-trifluoromethyl-4,4'-dichloro----.
Column 3, line 40, the word "a" should be deleted.
Column 6, line 15, "phosphorus" should read ---phosphorous---.
Column 6, line 39, "3-[S-ethyl-S-(3-dodecoxy-2-hydroxypropylsulfonio] pro-" should read ---3-[S-ethyl-S-(3-dodecoxy-2-hydroxypropyl)sulfonio]-pro----.
Column 6, line 61, "U.S. Pat. No. 2,528,3787" should read --- U.S. Pat. No. 2,528,378---.
Column 7, line 21, the entire line should be deleted.
Column 7, line 30, "2-chlorodibenz(be)(1,4)oxidinium" should read ---2-chlorodibenz(be)(1,4)oxiodinium---.
Column 7, line 51, the compound "3-Cl DBOI-Cl+RD50" should be underscored.
Column 7, line 55, "1-Cl DBOI$_4$Cl+TCC" should read ---1-Cl DBOI-Cl+TCC
Column 7, line 72, "2-Cl DBPI-Cl+G-11" should read ---2-Cl DBOI-Cl+G-11---.
Column 8, line 27, "% C_{16}" should read ---9% C_{16}---.
Column 10, line 15, "fluoro-methyl-4,4'-dichlorocarbanilide" should read ---fluoromethyl-4,4'-dichlorocarbanilide---.

Signed and sealed this 11th day of January 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents