

# UNITED STATES PATENT OFFICE

2,380,011

## GERMICIDAL PREPARATIONS

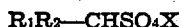
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8 Claims. (Cl. 167-82)

This invention relates to improvements in bactericidal preparations and more particularly to such preparations containing a secondary alkyl sulphate as the active germicidal agent.

The secondary alkyl sulphates in accordance with our invention have at least 8 carbon atoms in their molecular structure and contain, preferably, one or more methyl, ethyl, other alkyl, aryl, and/or aralkyl groups so attached to the carbon chain as to provide compounds having at least one branched-chain in their structure. These compounds have the general formula



wherein  $R_1$  and  $R_2$  are alkyl groups, either or both of which may be, and, preferably, are branched-chain secondary alkyl groups, and wherein  $X$  is a cation such as sodium or other alkali metal, including ammonium, or an organic amine such as triethanolamine, or an alkaline earth metal such as calcium, and the like. Preferably, the branched-chain secondary alkyl sulphates in accordance with the invention contain from 10 to 21 carbon atoms in their molecular structure and may contain even more carbon atoms, if desired.

Examples of bactericidal secondary alkyl sulphates are sodium tetradecyl sulphate, which is derived from 2-methyl-7-ethyl-undecanol-4, and sodium heptadecyl sulphate, which is derived from 3,9-diethyl-tridecanol-6.

The branched-chain secondary alkyl sulphates have marked wetting and detergent properties and ionize with the lyophobic group in the anion. Hence they are classified as anionic wetting agents or detergents.

With the exception of the branched-chain secondary alkyl sulphates, the anionic detergents, when used in substantially neutral solutions and in low concentrations, say 1:3000, do not inhibit the metabolism of the gram-positive microorganisms as a class and have little or no inhibiting effect on the metabolism of the gram-negative microorganisms. At best, the anionic detergents other than the secondary alkyl sulphates, in neutral solutions and in the concentrations stated, have only a selective action on but a few, in some instances only 1 or 2, of the gram-positive microorganisms and in many instances actually tend to stimulate the metabolic activity of some of these organisms.

On the other hand, the branched-chain secondary alkyl sulphates, under the same conditions and even in lower concentrations, appear to in-

hibit the metabolism of the gram-positive organisms as a class and have an inhibitory action on the metabolism of some of the gram-negative organisms. In actual tests conducted by us, we have found that substantially neutral solutions of the branched-chain secondary alkyl sulphates, such as the sodium salt of 3,9-diethyltridecanol-6, in concentrations of 1:3000, substantially completely inhibit the metabolism of the gram-positive microorganisms *Staphylococcus aureus*, *Staphylococcus albus*, *Sarcina lutea*, *Micrococcus tetragenus* and *Lactobacillus* as well as the gram-negative microorganism *Proteus vulgaris*.

In higher concentrations, in the order of about 0.1% to about 2%, the branched-chain secondary alkyl sulfates exercise an active and effective bactericidal action on the gram-positive organisms as well as on some of the gram-negative organisms. If the medium or carrier in which these secondary alkyl sulfates are dissolved or dispersed is slightly acid, say of a pH of about 6.5 or lower, preferably of about 5 to about 4.5, the bactericidal effectiveness of these compounds is enhanced. In higher concentrations, say up to 10% to 25% and even higher, the branched-chain secondary alkyl sulfates exhibit a more pronounced bactericidal effectiveness and have desirable killing power.

The germicidal effectiveness of the branched-chain secondary alkyl sulfates against acid producing bacteria such as *Lactobacillus* is particularly pronounced. Accordingly, these compounds lend themselves for use for the treatment and prevention of dental caries. We have found that these compounds may be incorporated in tooth paste, tooth powders, mouth washes, chewing gum, cough drops, lozenges and the like and that when introduced into the oral cavity in such media tend to inhibit the metabolic activities of the bacteria associated with dental decay. Chewing gum containing the sodium salt of sulphated 3,9-diethyl-tridecanol-6 is particularly effective for this purpose. We prefer that the media in which these compounds are used be slightly acid since the compounds are more effective in such media, as heretofore pointed out.

Since the compounds used in accordance with our invention possess improved wetting and penetrating properties, they are able to reach bacteria which are covered by organic material and food particles on the tooth surface, and also the bacteria in the carious lesions. The integral property of good wetting ability and good germicidal activity confers upon the secondary alcohol sulfates, particularly the branched-chain secondary

alkyl sulfates, especial value not only in the treatment of dental diseases, but also in the treatment of wounds and in any situation where contact between bacteria and the germicidal agent is difficult to achieve. The compounds also function as effective cleansing agents.

The quantity of the branched chain secondary alkyl sulfates in the desired media or carrier may vary rather widely as desired. Thus, the quantity of the compounds in respect of the carrier may vary, by weight, from about 0.1% to about 10% and even up to 25% or 50% and even higher, if desired. For most purposes, satisfactory results are obtained with these compounds in proportions varying from about 0.1% to 0.5% as the lower limit and up to 5% as the upper limit. For certain special uses, it may be desirable to increase the proportions considerably and in some instances even lesser proportions may be used to obtain the desired results.

The following examples illustrate some commercial applications of our invention. It is to be understood that our invention is not to be construed as limited to the details of the examples since the constituents and proportions of the ingredients of the illustrative examples may be varied rather widely, as is well-understood. In the examples, the term "parts" means parts by weight.

*Example 1.—Antiseptic and germicidal ointment*

	Parts
Cocconut oil .....	40.0
Petrolatum .....	57.0
Sodium salt of sulphated 3,9-diethyl-tri-decanol-6 .....	3.0

*Example 2.—Mouth wash*

	Parts
Methyl salicylate .....	0.05
Eucalyptus oil .....	0.2
Sodium salt of sulphated 2-methyl-7-ethylundecanol-4 .....	1.8
95% alcohol .....	10.0
Water .....	87.95

*Example 3.—After-shaving lotion*

	Parts
Menthol .....	0.2
Glycerin .....	10.0
Sodium salt of sulphated 2-methyl-7-ethylundecanol-4 .....	0.5
Water .....	40.0
95% alcohol .....	49.3

*Example 4.—Brushless shaving cream*

	Parts
White mineral oil .....	15.0
Glyceryl monostearate .....	15.0
Sodium salt of sulphated 3,9-diethyl-tridecanol-6 .....	1.5
Water .....	68.5

*Example 5.—Tooth paste*

	Parts
Glycerin .....	20.0
Distilled water .....	20.0
Powdered gum tragacanth .....	0.5
Flavoring oils .....	1.0
Sodium salt of sulphated 3,9-diethyl-tridecanol-6 .....	1.0
Tricalcium phosphate .....	4.0
Sodium metaphosphate .....	53.5

*Example 6.—Liquid dentifrice*

	Parts
Glycerin .....	10.0
Gum tragacanth .....	0.8
Flavoring oils .....	0.7
Saccharin .....	0.03
Sodium salt of sulphated 3,9-diethyl-tridecanol-6 .....	1.0
95% alcohol .....	25.0
Water .....	61.97

It is to be noted that in the foregoing examples of compositions in accordance with our invention an emollient material such as an oil or glycerine is included.

The use of the branched-chain secondary alkyl sulphates in shaving creams, cold creams, face and hand lotions, rubbing liniments and the like is particularly desirable since these compounds are effective against the cocci type of bacteria such as staphylococci, streptococci and the like. They are also particularly useful for their germicidal and detergent properties in hair shampoos, in contraceptive jellies, pastes and solutions and in solutions used to irrigate the nasal passages and the sinuses. They are also especially useful for washing and impregnating stockings and other articles of clothing which are worn adjacent the skin. They may also be used in solid and liquid germicidal soaps as an active germicidal agent. Liquid soap solutions containing these compounds are also useful for cleaning artificial teeth and the like.

While in the illustrative examples the invention has been illustrated by the recitation of certain specific compounds falling within the class of branched-chain secondary alkyl sulfates in accordance with our invention, it is to be understood that our invention is not to be construed as limited to these compounds since other secondary alkyl sulfates such as the sodium salt of sulphated 9-ethyl-5-methyltridecanol-6, the triethanolamine salt of sulphated 3,9-diethyltridecanol-6, the monoethanolamine salt of sulphated 7-ethyl-2-methylundecanol-4 and the like, or any desired mixture of the secondary alkyl sulphates may be used.

By the expression "branched-chain secondary alkyl sulphate" as used in the specification and claims, it is intended to designate and include a branched-chain alkyl sulphate derived from a secondary aliphatic alcohol containing at least 8 carbon atoms in which a hydroxyl group is located on a carbon atom other than a terminal carbon atom.

We claim:

1. A dentifrice comprising a branched-chain secondary alkyl sulphate having at least 8 carbon atoms in the molecular structure as an active germicidal agent, a flavoring oil and a polishing agent.

2. A dentifrice comprising a branched-chain secondary alkyl sulphate containing from 10 to 21 carbon atoms in the molecular structure as an active germicidal agent, a flavoring oil and a polishing agent.

3. A dentifrice comprising a branched-chain secondary alkyl sulphate containing from 10 to 21 carbon atoms in the molecular structure as an active germicidal agent and a polishing agent.

4. A dentifrice comprising a branched-chain secondary alkyl sulphate containing from 10 to 21 carbon atoms in the molecular structure as an active germicidal agent and a flavoring oil.

5. A dentifrice comprising the sodium salt of

sulphated 3,9-diethyl-tridecanol-6 and a polishing agent.

6. Chewing gum containing a branched-chain secondary alkyl sulphate having from 10 to 21 carbon atoms in the molecular structure as an active germicidal agent.

7. Chewing gum containing the sodium salt of sulphated 3,9-diethyl-tridecanol-6.

8. Composition of matter for the oral cavity comprising a secondary alkyl sulphate containing from 8 to 21 carbon atoms in the molecular structure as an active germicidal agent and a carrier base therefor selected from the class consisting of tooth powder, tooth paste and chewing gum.

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BENJAMIN F. MILLER.

CERTIFICATE OF CORRECTION.

Patent No. 2,380,011.

July 10, 1945.

ZELMA BAKER, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 8, Example 6, under the heading "Parts", for "1.0" read --1.5--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of October, A. D. 1945.

Leslie Frazer

First Assistant Commissioner of Patents.

(Seal)

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