United States Patent [19]

Mod et al.

[11] **3,869,483**

[45] **Mar. 4, 1975**

[54] **QUATERNARY AMMONIUM SALTS OF N-SUBSTITUTED PALMITAMIDES**

[75] Inventors: **Robert R. Mod; Frank C. Magne; Evald L. Skau; Gene Sumrell,** all of New Orleans, La.

[73] Assignee: **The United States of America as represented by the Secretary of Agriculture,** Washington, D.C.

[22] Filed: **June 23, 1972**

[21] Appl. No.: **265,869**

[52] **U.S. Cl.**..... **260/404.5,** 260/268 BC, 260/268 C, 260/293.88, 424/30, 424/250, 424/267

[51] **Int. Cl.**..... **C07c 103/30**

[58] **Field of Search**..... 260/404.5

[56] **References Cited**

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Primary Examiner—Lewis Gotts
Assistant Examiner—Ethel G. Love
Attorney, Agent, or Firm—M. Howard Silverstein; Max D. Hensley

[57] **ABSTRACT**

A number of new quaternary ammonium salts of n-substituted palmitamides have been prepared by conventional methods. These derivatives have been characterized by exhibiting antimycotic activity and three of the derivatives, 4-palmitoyl-1,1-dimethylpiperazinium iodide, (2-palmitoylaminoethyl)trimethylammonium iodide, and 4-palmitoyl-1-methyl-1-(1,4,5,6,7,7-hexachlorobicyclo[2.2.1]-hepta-2,5-diene-2-methylene)piperazinium bromide have been further characterized by exhibiting nematocidal activity.

3 Claims, No Drawings

QUATERNARY AMMONIUM SALTS OF N-SUBSTITUTED PALMITAMIDES

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

This invention relates to certain new nitrogen containing compounds. More particularly, this invention relates to quaternary ammonium salts of tertiary amino aliphatic amides which exhibit antimicrobial and nematocidal activity. The quaternary ammonium salts that are the subject of this invention are characterized by the fact that as growth inhibitors, they are effective against a variety of microorganisms that include bacteria and molds, many of which are pathogenic. Some of these derivatives are further characterized by their nematocidal activity against *Panagrellus redivivus*.

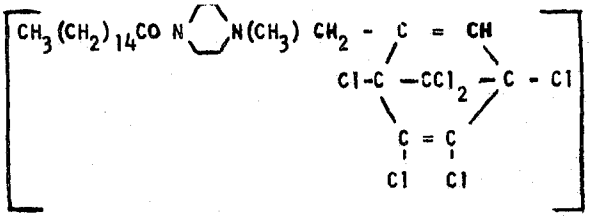
The findings herein disclosed are considered remarkable in that in some notable instances compounds that are closely related from the point of view of chemical architecture exhibit quite opposite effects against the same organisms. For example, one compound may exhibit properties as a growth inhibitor against one particular organism while a closely related counterpart may serve to promote increased growth for the same organism. Some of these amides exhibit broad antimicrobial spectrum, whereas others exhibit selective antimicrobial spectrum.

The compounds which are the subject of this invention are:

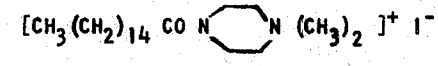
(2-stearoylaminoethyl)trimethyl ammonium iodide, $[CH_3(CH_2)_{16}CONHCH_2CH_2N(CH_3)_3]^+1^-$

(2-palmitoylaminoethyl)diethylpropargylammonium bromide, $[CH_3(CH_2)_{14}CONHCH_2CH_2N(C_2H_5)_2CH_2C{\equiv}CH]^+Br^-$

4-palmitoyl-1-methyl-1-[1,4,5,6,7,7-hexachlorobicyclo[2.2.1]-hepta-2,5-diene-2-methylene]piperazinlam bromide,



4-palmitoyl-1,1-dimethylpiperazinium iodide,



4-decanoyl-1,1-dimethylpiperazinium iodide,



4-stearoyl-1,1-dimethylpiperazinium iodide,



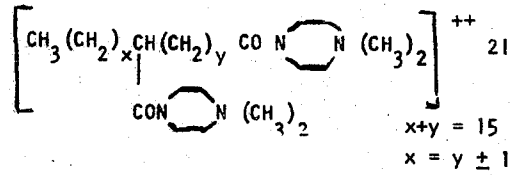
(2-decanoylaminoethyl)trimethylammonium iodide, $[CH_3(CH_2)_8CONH\ CH_2CH_2N(CH_3)_3]^+1^-$

(2-palmitoylaminoethyl)trimethylammonium iodide, $[CH_3(CH_2)_{14}CONHCH_2CH_2N(CH_3)_3]^+1^-$

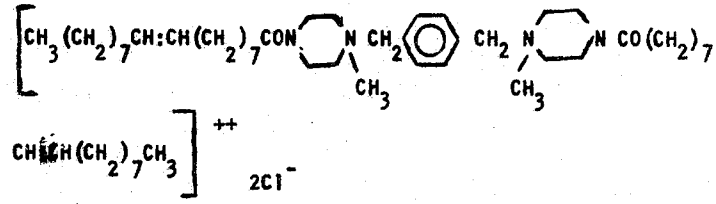
(2-palmitoylaminoethyl)diethylmethylammonium iodide, $[CH_3(CH_2)_{14}CONHCH_2CH_2N(C_2H_5)_2CH_3]^+1^-$

(2-oleoylaminoethyl)trimethylammonium iodide, $[CH_3(CH_2)_7CH{:}CH(CH_2)_7CONHCH_2CH_2N(CH_3)_3]^+1^-$

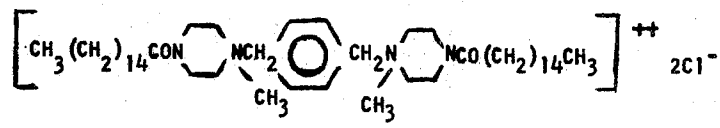
dimethiodide of 9(10)-[(1-methylpiperazino)carbonyl]-4-octadecanoyl-1-methylpiperazine,



1,4-xylylene-bis (4-oleoyl-1-methylpiperazinium chloride),



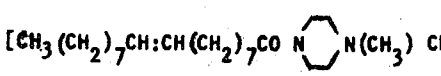
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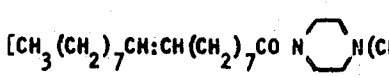
4-Palmitoyl-1-methyl-1-propargylpiperazinium bromide,



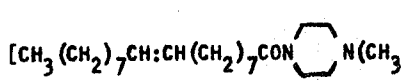
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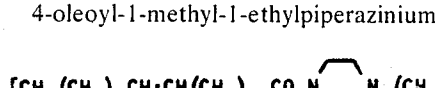
4-oleoyl-1,1-dimethylpiperazinium iodide,



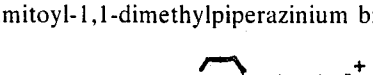
4-oleoyl-1,1-dimethylpiperazinium bromide,



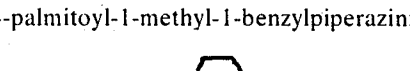
4-oleoyl-1-methyl-1-ethylpiperazinium bromide,



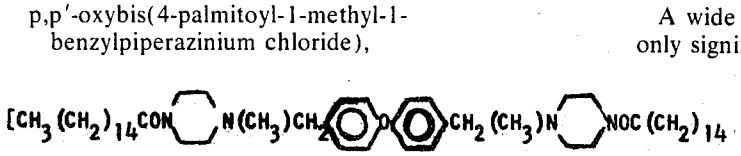
4-palmitoyl-1,1-dimethylpiperazinium bromide,



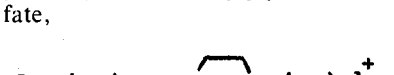
4-palmitoyl-1-methyl-1-benzylpiperazinium chloride,



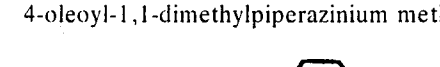
p,p'-oxybis(4-palmitoyl-1-methyl-1-benzylpiperazinium chloride),



4-palmitoyl-1,1-dimethylpiperazinium methyl sulfate,

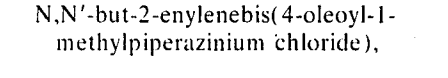


4-oleoyl-1,1-dimethylpiperazinium methyl sulfate,

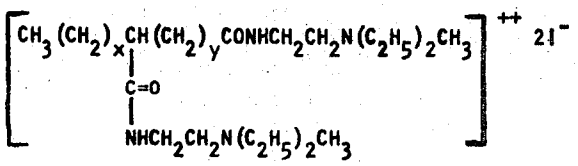


p,p'-xylylene bis[(2-palmitoylaminoethyl)diethylammonium chloride], $[CH_3(CH_2)_{14}CONHCH_2CH_2N(C_2H_5)_2CH_2C_6H_4CH_2N(C_2H_5)_2CH_2CH_2NHCO\ (CH_2)_{14}CH_3]^{++}2Cl^-$

N,N'-but-2-enylenebis(4-oleoyl-1-methylpiperazinium chloride),



dimethiodide of 9(10)-[(2-diethylaminoethyl)carbonyl]-N-(2-diethylaminoethyl)octadecanamide,

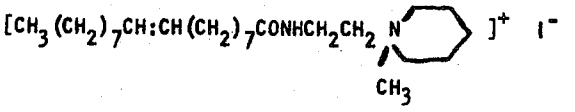


(2-stearoylaminoethyl)diethylmethylammonium iodide, $[CH_3(CH_2)_{16}CONHCH_2CH_2N(C_2H_5)_2CH_3]^+I^-$

2-(oleoylaminoethyl)propargyldimethylammonium bromide, $[CH_3(CH_2)_7CH{:}CH(CH_2)_7CONHCH_2CH_2N(CH_3)_2CH_2C\equiv CH]^+Br^-$

(2-palmitoylaminoethyl)propargyldimethylammonium bromide, $[CH_3(CH_2)_{14}CONHCH_2CH_2N(CH_3)_2CH_2C\equiv CH]^+Br^-$

and N-methyl-N-(2-oleoylaminoethyl)piperidinium iodide



The new nitrogen-containing compounds which are the subject of this invention were prepared by conventional methods.

The bioactivity of these various new nitrogen-containing compounds has been established by us in vitro but, as will be apparent to those skilled in the arts pertaining to the growth inhibition of bacteria and molds, the compounds, besides being used as such, will for utilitarian purposes commonly be formulated using a diluent that can be either liquid, viscous, or solid.

A wide variety of extending agents is operable, the only significant requirement being that the diluent or extender be inert with respect to the amide involved. Petroleum jellies, various alcohols and polyols, vegetable oils and the like are suitable.

Specific examples showing the preparation of each of the new compounds being claimed are set forth below along with appropriate data in tabular form which is being submitted for the purpose of establishing the growth inhibiting properties of the claimed compounds.

EXPERIMENTAL

Difco Bacto Dehydrated Stock Culture Agar at pH 7.0, and Difco Dehydrated Mycological Agar at pH 7.0 were selected to test the inhibition of the bacteria and mold cultures, respectively.

Fatty acid derivatives were screened for their antimicrobial activity against two bacteria — Bacillus Species and Pseudomonas Species; five molds most of which are pathogenic — *Candida albicans*, *Microsporum gypseum*, *Trichophyton rubrum*, *Trichophyton violaceum*, and *Aspergillus flavus*, as illustrated in Table I.

Several fatty acid derivatives were screened for their nematocidal activity against *Panagrellus Redivivus* as shown in Table II.

Seeded agar plates were used to measure the antimicrobial activity against bacteria. The filter paper disc method was used to evaluate the liquid compounds, and the cylinder plate method was used to evaluate the solid compounds. Standard-size paper discs or uniform-size stainless steel cylinders were placed on the surface of the previously inoculated plates. The liquid compounds were pipetted onto the discs and the solid compounds were introduced into the stainless steel cylinders.

Streaked and poured agar plates were used to measure the antimycotic activity against molds. The streaked agar plates were prepared by streaking the hardened agar plates with the test mold, and the poured agar plates were prepared by pouring dilutions of mold spores over the hardened agar plates. The compounds were then added onto specified areas of these streaked and poured agar plates. The paper disc method was used to evaluate the liquid and solid compounds, the solid compounds were simply dissolved in glycerol or ethanol before applying onto the paper disc. The solid compounds were also tested in pure form by introducing the solid material directly on the surface of the inoculated agar plates.

To eliminate any error which could result from an insufficient number of tests, a minimum of three experiments employing duplicate plates were used for measurig the antimicrobial activity of each compound.

All test plates were incubated at the optimum growing temperature for each organism. The tabulated results illustrated in Table I were obtained from periodic readings after 1,2,3, and 5 days, respectively.

The compounds tested as nematocides were made up to 100,000 p.p.m. in organic solvent; in most cases, acetone was employed. This solution was diluted 1:10 in water with 1 percent Tween 80. The 10,000 p.p.m. solution was added to an equal volume of nematocides, *Panagrellus redivivus* in water to give a final concentration of 5000 p.p.m. After 24 hours, the organisms were examined under the microscope and the number of dead nematodes ascertained.

EXAMPLE 1

(2-Palmitoylaminoethyl)trimetbyl ammonium iodide.

Ten grams (0.031 mole) of N-(dimethylaminoethyl)-palmitamide was dissolved in 25 ml of diethyl ether, after which 4.4 grams (0.031 mole) of methyl iodide was added. After standing for ten hours, the mixture was centrifuged employing a Skau tube. The white solid was given two recrystallizations from a 1:1 acetone-ethanol mixture. The product, (2-palmitoylaminoethyl)trimethyl ammonium iodide had a nitrogen content of 5.9% (theory 6.17%).

EXAMPLE 2

4-Palmitoyl-1-methyl-1-[1,4,5,6,7,7-hexachlorobicyclo[2.2.1]hepta-2,5-diene-2-methylene]piperazinium bromide.

A sample of 11.6 grams (0.030 mole) of 1,4,5,6,7,7-hexachloro-2-bromomethylbicyclo[2.2.1]-2,5-heptadiene; 10 grams (0.030 mole) of N-palmitoyl-N'-methylpiperazine and 50 ml of 2,2-dimethoxypropane were placed in a flask equipped with reflux condenser. The mixture was refluxed for 10 hours after which the solvent was removed by stripping under reduced pressure. The product was given four recrystallizations from 1:1 acetone-ethanol mixture and dried over P_2O_5 in a vacuum dessicator. The product, 4-Palmitoyl-1-methyl-1-[1,4,5,6,7,7-hexachlorobicyclo[2.2.1]hepta-2,5-diene-2-methylene]piperazinium bromide had a nitrogen content of 3.90% (theory 3.84%).

EXAMPLE 3

(2-Stearoylaminoethyl)trimethyl ammonium iodide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.015 mole) of N-(dimethylaminoethyl)stearamide and 2.1 grams (0.015 mole) of methyl iodide. The product, (2-Stearoylaminoethyl)trimethyl ammonium iodide, had a nitrogen content of 5.31% (theory 5.81%).

EXAMPLE 4

(2-Decanoylaminoethyl)trimethyl ammonium iodide.

This compound was prepared by the procedure of Example 1, from 10 grams (0.042 mole) of N-(dimethylaminoethyl)decanamide and 5.9 grams (0.042 mole) of methyl iodide. The product, (2-Decanoylaminoethyl)trimethyl ammonium iodide, had a nitrogen content of 7.14% (theory 7.57%).

EXAMPLE 5

(2-Oleoylaminoethyl)trimethyl ammonium iodide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.015 mole) of N-(Dimethylaminoethyl)oleamide and 2 grams (0.014 mole) of methyl iodide. The product, (2-Oleoylaminoethyl)trimethyl ammonium iodide, had a nitrogen content of 5.71% (theory 5.83%).

EXAMPLE 6

(2-Palmitoylaminoethyl)diethylmethyl ammonium iodide. This compound was prepared by the procedure of Example 1, from 10 grams (0.028 mole) of N-(Diethylaminoethyl) palmitamide and 4 grams (0.028 mole) of methyl iodide. The product, (2-Palmitoylaminoethyl)diethylmethylammonium iodide, had a nitrogen content of 5.27% (theory 5.64%).

EXAMPLE 7

(2-Palmitoylaminoethyl)diethylpropargylammonium bromide.

This compound was prepared by the procedure of Example 1, from 3 grams (0.008 mole) of N-(Diethylaminoethyl)palmitamide and 1 grams (0.008 mole) of propargyl bromide. The product, (2-Palmitoylaminoethyl)diethylpropargylammonium bromide, had a nitrogen content of 5.89% (theory 5.92%).

EXAMPLE 8

p,p'-Xylylene-bis[(2-palmitoylaminoethyl)diethylammonium chloride].

This compound was prepared by the procedure of Example 1, from 10 grams (0.028 mole) of N-(Diethylaminoethyl)palmitamide and 2.5 grams (0.014 mole) of α,α-dichloro-p-xylene. The product, p,p'-xylylene-bis(2-palmitoylaminoethyldiethylammonium chloride) had a nitrogen content of 6.98% (theory 6.34%).

EXAMPLE 9

4-Stearoyl-1,1-dimethylpiperazinium iodide.

This compound was prepared by the procedure of Example 1, from 10 grams (0.027 mole) of N-stearoyl-N'-methylpiperazine and 3.9 grams (0.028 mole) of methyl iodide. The product, 4-stearoyl-1,1-dimethylpiperazinium iodide, had a nitrogen content of 5.46% (theory 5.51%).

EXAMPLE 10

4-Palmitoyl-1,1-dimethylpiperazinium iodide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.015 mole) of N-palmitoyl-N'-methylpiperazine and 2.3 grams (0.016 mole) of methyl iodide. The product, 4-Palmitoyl-1,1-dimethylpiperazinium iodide, had a nitrogen content of 5.78% (theory 5.83%).

EXAMPLE 11

4-Decanoyl-1,1-dimethylpiperazinium iodide.

This compound was prepared by the procedure of Example 1, from 10 grams (0.039 mole) of N-Decanoyl-N'-methylpiperazine and 5.6 grams (0.039 mole) of methyl iodide. The product, 4-decanoyl-1,1-dimethylpiperazinium iodide, had a nitrogen content of 7.02% (theory 7.08%).

EXAMPLE 12

4-Palmitoyl-1-methyl-1-propargylpiperazinium bromide.

This compound was prepared by the procedure of Example 1 from 10 grams (0.030 mole) of N-palmitoyl-N'-methylpiperazine and 3.8 grams (0.032 mole) of propargyl bromide. The product, 4-Palmitoyl-1-methyl-1-propargylpiperazinium bromide, had a nitrogen content of 5.99% (theory 6.12%).

EXAMPLE 13

4-Oleoyl-1-methyl-1-propargylpiperazinium bromide.

This compound was prepared by the procedure of Example 1 from 10 grams (0.027 mole) of N-oleoyl-N-methyl-piperazine and 3.5 grams (0.029 mole) of propargyl bromide. The product, 4-Oleoyl-1-methyl-1-propargylpiperazinium bromide, had a nitrogen content of 5.73% (theory 5.79%).

EXAMPLE 14

4-Oleoyl-1,1-dimethylpiperazinium iodide.

This compound was prepared by the procedure of Example 1, from 10 grams (0.027 mole) of N-oleoyl-N'-methylpiperazine and 4.5 grams (0.032 mole) of methyl iodide. The product, 4-Oleoyl-1,1-dimethylpiperazinium iodide, had a nitrogen content of 5.52% (theory 5.54%).

EXAMPLE 15

4-Oleoyl-1-methyl-1-ethylpiperazinium bromide.

This compound was prepared by the procedure of Example 1, from 10 grams (0.027 mole) of N-Oleoyl-N'-methylpiperazine and 4 grams (0.036 mole) of ethyl bromide. The product, 4-Oleoyl-1-methyl-1-ethylpiperazinium bromide, had a nitrogen content of 5.86% (theory 5.92%).

EXAMPLE 16

4-Oleoyl-1,1-dimethylpiperazinium bromide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.013 mole) of N-Oleoyl-N'-methylpiperazine and 1.4 grams (0.015 mole) of methyl bromide. The product, 4-Oleoyl-1,1-dimethylpiperazinium bromide, had a nitrogen content of 5.50% (theory 6.10%).

EXAMPLE 17

4-Palmitoyl-1,1-dimethylpiperazinium bromide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.015 mole) of N-palmitoyl-N'-methylpiperazine and 1.7 grams (0.018 mole) of methyl bromide. The product, 4-Palmitoyl-1,1-dimethylpiperazinium bromide, had a nitrogen content of 6.18% (theory 6.46 %).

EXAMPLE 18

4-Palmitoyl-1-methyl-1-benzylpiperazinium chloride.

This compound was prepared by the procedure of Example 1, from 10 grams (0.030 mole) of N-palmitoyl-N'-methylpiperazine and 4 grams (0.032 mole) of benzyl chloride. The product, 4-Palmitoyl-1-methyl-1-benzylpiperazinium chloride, had a nitrogen content of 5.85% (theory 6.02%).

EXAMPLE 19

1,4-Xylylene-bis(4-oleoyl-1-methylpiperazinium chloride).

This compound was prepared by the procedure of Example 1, from 10 grams (0.027 mole) of N-Oleoyl-N'-methylpiperazine and 2.4 grams (0.013 mole) of α,α'-dichloro-p-xylene. The product, 1,4-Xylylene-bis(4-oleoyl-1-methylpiperazinium chloride), had a nitrogen content of 5.54% (theory 6.20%).

EXAMPLE 20

1,4-Xylylene-bis(4-palmitoyl-1-methylpiperazinium chloride).

This compound was prepared by the procedure of Example 1, from 10 grams (0.030 mole) of N-Palmitoyl-N'-methylpiperazine and 2.6 grams (0.015 mole) of α,α-dichloro-p-xylene. The product, 1,4-Xylylene-bis(4-palmitoyl-1-methylpiperazinium chloride), had a nitrogen content of 6.69% (theory 6.58%).

EXAMPLE 21

N,N'-But-2-enylenebis(4-oleoyl-1-methylpiperazinium chloride).

This compound was prepared by the procedure of Example 1, from 10 grams (0.027 mole) of N-Oleoyl-N'-methylpiperazine and 1.7 grams (0.013 mole) of 1,4-dichloro-2-butene. The product, N,N'-But-2-enylene-bis(4-oleoyl-1-methylpiperazinium chloride), had a nitrogen content of 6.15% (theory 6.56%).

EXAMPLE 22

4-Palmitoyl-1,1-dimethylpiperazinium methyl sulfate.

This compound was prepared by the procedure of Example 1, from 10 grams (0.030 mole) of N-Palmitoyl-N'-methylpiperazine and 4 grams (0.032 mole of dimethyl sulfate. The product, 4-Palmitoyl-1,1-dimethylpiperazinium methyl sulfate, had a nitrogen content of 5.95% (theory 6.03%).

EXAMPLE 23

4-Oleoyl-1,1-dimethylpiperazinium methyl sulfate.

This compound was prepared by the procedure of Example 1, from 9 grams (0.025 mole) of N-Oleoyl-N'-methylpiperazine and 4 grams (0.032 mole) of dimethyl sulfate. The product, 4-Oleoyl-1,1-dimethylpiperazinium methyl sulfate, had a nitrogen content of 5.61% (theory 5.71%).

EXAMPLE 24

p,p'-Oxybis(4-palmitoyl-1-methyl-1-benzylpiperazinium chloride).

This compound was prepared by the procedure of Example 1, from 5 grams (0.015 mole) of N-palmitoyl-

N'-methylpiperazine and 2 grams (0.008 mole) of α,α-dichloroditoluoyl ether. The product, p,p'-oxybis(4-palmitoyl-1-methyl-1-benzylpiperazinium chloride), had a nitrogen content of 5.57% (theory 5.93%).

EXAMPLE 25

Dimethiodide of 9(10)-[(1-methylpiperazino)carbonyl]-4-octadecanoyl-1-methylpiperazine.

This compound was prepared by the procedure of Example 1, from 5 grams (0.01 mole) of 9 (10)-[1-methylpiperazino)carbonyl]-4-octadecanoyl-1-methylpiperazine and 3 grams (0.021 mole) of methyl iodide. The product, dimethiodide of 9(10)-[(1-methylpiperazino)carbonyl]-4-octadecanoyl-1-methylpiperazine, had a nitrogen content of 6.93% (theory 7.21%).

EXAMPLE 26

N-Methyl-N-(2-oleoylaminoethyl)piperidinium iodide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.013 mole) of N-(2-Piperidinoethyl)oleamide and 1.8 grams (0.013 mole) of methyl iodide. The product, N-methyl-N-(2-oleoylaminoethyl)piperidinium iodide, had a nitrogen content of 5.06% (theory 5.24%).

EXAMPLE 27

(2-Palmitoylaminoethyl)propargyldimethylammonium bromide.

This compound was prepared by the procedure of Example 1, from 12 grams (0.036 mole) of N-(dimethylaminoethyl)palmitamide and 4.4 grams (0.036 mole) of propargyl bromide. The product, (2-Palmitoylaminoethyl)propargyldimethylammonium bromide, had a nitrogen content of 6.10% (theory 6.29%).

EXAMPLE 28

(2-Oleoylaminoethyl)propargyldimethylammonium bromide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.014 mole) of N-(dimethylaminoethyl)oleamide and 1.7 grams (0.014 mole) of propargyl bromide. The product, (2-oleoylaminoethyl)propargyldimethylammonium bromide, had a nitrogen content of 5.77% (theory 5.94%).

EXAMPLE 29

Dimethiodide of 9(10)[(2-diethylaminoethyl)carbonyl]-N-(2-diethylaminoethyl-)octadecanamide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.01 mole) of N[9,10[(N,N-diethylethylenediamino)carbonyl]octadecanoyl]N,N-diethylenediamine and 2.8 grams (0.02 mole) of methyl iodide. The product, Dimethiodide of 9(10)[(2-diethylaminoethyl)carbonyl]-N-(2-diethylaminoethyl-)octadecanamide, had a nitrogen content of 6.58% (theory 6.93%).

EXAMPLE 30

(2-Stearoylaminoethyl)diethylmethylammonium iodide.

This compound was prepared by the procedure of Example 1, from 5 grams (0.013 mole) of N-(Diethylaminoethyl)stearamide and 1.9 grams (0.013 mole) of methyl iodide. The product, (2-Stearoylaminoethyl)diethylmethylammonium iodide, had a nitrogen content of 5.05% (theory 5.11%).

TABLE I

ANTIMICROBIAL ACTIVITY OF SOME FATTY ACID DERIVATIVES

Compounds	Antimicrobial Activity[1] Microorganisms[2]						
	A	B	C	D	E	F	G
(2-Stearoylaminoethyl)trimethyl ammonion iodide	x		x	x	x	x	—
(2-Palmitoylaminoethyl)diethylproparylammonium bromide	—		—	—	—	—	x
4-Palmitoyl-1-methyl-1-[1,4,5,6,7,7-hexachloro-bicyclo[2.2.1]hepta-2,5-diene-2-methylene]piperazinium bromide	—		—	—	—	—	—
4-Palmitoyl-1,1-dimethyl-piperazinium iodide	xx	x	xx	xx			
4-Decanoyl-1,1-dimethyl-piperazinium iodide	xx		xx	xx	xx	xx	xx
4-Stearoyl-1,1-dimethyl-piperazinium iodide	—		—	—	—	x	—
(2-Decanoylaminoethyl)trimethyl ammonium iodide	xx	xx	++	x			
(2-Palmitoylaminoethyl)trimethyl ammonium iodide	x		x	x	x	xx	x
(2-Palmitoylaminoethyl)diethylmethyl ammonium iodide	+	x	xx	xx			
(2-Oleoylaminoethyl)trimethyl ammonium iodide	++		++	++	++	++	++
Dimethiodide of 9(10)-[(1-methylpiperazino)carbonyl]-4-octadecanoyl-1-methyl-piperazine	xx		xx	xx	+	xx	xx
1,4-Xylylene-bis(4-oleoyl-1-methylpiperazinium chloride)	x	—	—	xx			
1,4-Xylylene-bis(4-palmitoyl-1-methylpiperazinium chloride)	xx	—	—	—			

TABLE I—Continued

ANTIMICROBIAL ACTIVITY OF SOME FATTY ACID DERIVATIVES

Compounds	Antimicrobial Activity[1/] Microorganisms[2/]						
	A	B	C	D	E	F	G
4-Palmitoyl-1-methyl-1-propargylpiperazinium bromide	++	xx	x	xx			
4-Oleoyl-1-methyl-1-propargylpiperazinium bromide	+	x	xx	xx			
4-Oleoyl-1,1-dimethylpiperazinium iodide	++	x	xx	++			
4-Oleoyl-1,1-dimethylpiperazinium bromide	xx	xx	xx	++			
4-Oleoyl-1-methyl-1-ethylpiperazinium bromide	xx	++	xx	x			
4-Palmitoyl-1,1-dimethylpiperazinium bromide	xx	xx	xx	+			
4-Palmitoyl-1-methyl-1-benzylpiperazinium chloride	xx	xx	+	+			
p,p'-Oxybis(4-palmitoyl-1-methyl-1-benzylpiperazinium chloride)	—	x	x	x			
4-Palmitoyl-1,1-dimethylpiperazinium methyl sulfate	++	xx	xx	xx			
4-Oleoyl-1,1-dimethylpiperazinium methyl sulfate	xx	xx	xx	xx			
p,p'-Xylylene bis(2-palmitoylaminoethyldiethylammonium chloride)	++	x	—	xx			
N,N'-But-2-enylenebis(4-oleoyl-1-methylpiperazinium chloride)	—	—	—	—			
Dimethiodide of 9(10)[(2-diethylaminoethyl)carbonyl]-N-(2-diethylaminoethyl)octadecanamide	++	+	++	x			
(2-Stearoylaminoethyl)diethylmethylammonium iodide	xx	xx	xx	xx			
(2-Oleoylaminoethyl)propargyldimethylammonium bromide	xx	xx	xx	++			
(2-Palmitoylaminoethyl)propargyldimethylammonium bromide	xx	xx	xx	xx			
N-Methyl-N-(2-Oleoylaminoethyl)piperidinium iodide	++	xx	xx	++			

1/ ++ = The zone of inhibition was at least 0.5 cm beyond disc or cylinder area at 120 hrs.
+ = The zone of inhibition was less than 0.5 cm beyond disc or cylinder area at 120 hrs.
xx = Organisms failed to grow on disc or cylinder area at 120 hrs.
x = Slight growth on the saturated disc or cylinder area at 120 hrs.
— = No inhibition detectable.

2/ A=*Trichophyton rubrum*
B=*Microsporum gypseum*
C=*Aspergillus flavus*
D=*Trichophyton violaceum*
E=*Candida albicans*
F=*Pseudomonas Sp.*
G=*Bacillus Sp.*

TABLE II

NEMATOCIDAL EVALUATION OF FATTY AMIDE DERIVATIVES

Compound	Organism *Panagrellus Redivivus*			
	Conc. ppm	% Dead	% Affected	% Normal
4-Palmitoyl-1,1-dimethyl-piperazinium iodide	10,000	100	0	0
	1,000	100	0	0
	100	90	10	0
	75	80	20	0
	50	20	30	50
	25	0	20	80
	10	0	10	90
(2-Palmitoylaminoethyl)trimethyl ammonium iodide	10,000	100	0	0
	1,000	100	0	0
	100	95	5	0
	75	80	15	5
	50	50	40	10

TABLE II—Continued

NEMATOCIDAL EVALUATION OF FATTY AMIDE DERIVATIVES

Compound	Organism *Panagrellus Redivivus*			
	Conc. ppm	% Dead	% Affected	% Normal
	25	0	10	90
	10	0	0	100
4-Palmitoyl-1-methyl-1-(1,4,5,6,7,7-hexachlorobicyclo[2.2.1]-hepta-2,5-diene-2-methylene)piperazinium bromide	10,000	100	0	0
	1,000	100	0	0
	100	60	20	20
	75	30	20	50
	50	5	10	85
	25	0	10	90
	10	0	0	100

We claim:

1. (2-palmitoylaminoethyl)propargyldimethylammonium bromide.

2. (2-oleoylaminoethyl)propargyldimethylammonium bromide.

3. (2-palmitoylaminoethyl)diethylpropargylammonium bromide.

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