

PATENT SPECIFICATION

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(72) Inventors ROBERT CARMELLO, BARRY ARTHUR SALKA
 and GARLAND GEORGE COREY

(54) NOVEL ANTIBACTERIAL COMPOSITIONS

(71) We, AMERICAN HOME PRODUCTS CORPORATION, a corporation organised and existing under the laws of the State of Delaware, United States of America, of 685, Third Avenue, New York 10017, New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to novel toilet bowl cleaner compositions. These compositions possess anti-microbial properties at the extremely low dilutions which are normally encountered with a product of this nature.

Compositions which automatically dispense cleaning agents and cleaning adjuncts into toilet bowls have been in commercial use for many years. However, the inhibition of the growth or multiplication of microbiological organisms in products of the above nature has been difficult to accomplish. This difficulty is due to the fact that most antimicrobial agents are ineffective at the extreme dilutions that automatic bowl cleaners are used.

Recently, a new antimicrobial agent, namely, 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol has been disclosed in U.S. Patent No. 3,506,720. The assignee of this patent (Ciba-Geigy) has published data (Irgasan DP-300 (Publication DC-25) which indicates that the minimum inhibitory concentration of 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol required for specific micro-organisms is 1 ppm for *S. aureus* and *P. mirabilis* and 3 ppm for *E. coli*. (Irgasan is a Registered Trade Mark).

Our copending U.K. Patent Application No. 56127/73, (Serial No. 1446069), discloses aqueous liquid compositions possessing anti-microbial properties comprising 5 - chloro - 2 - (2,4 - dichlorophenoxy) - phenol, isopropanol, an alkoxyated primary fatty

alcohol and a linear alkyl aryl sulfonate salt, optionally combined with known dyes and/or perfumes. Such liquid cleaning formulations exhibit bacteriostatic properties against *S. aureus*, *P. mirabilis* and *E. coli* at levels as low as 0.2 per million of the antimicrobial.

In particular this invention relates to the use of 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol in novel solid form antibacterial compositions. Thus this invention provides a solid antibacterial composition which comprises 1 to 30% by weight of 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol; 20 to 90% by weight of a normally solid ethoxylated alcohol adduct; 0.1 to 10% by weight of a normally liquid alkoxyated primary fatty alcohol; 0.1 to 10% by weight of a polyethylene glycol; and sodium sulphate.

By the term "primary fatty alcohol" is meant a straight chained primary alcohol derived from fats and oils or a synthetic C₈—C₂₂ normal primary alcohol.

For example a solid antibacterial composition of this invention may consist of:

Ingredient	% By Weight	
5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol (97% minimum activity)	1—3	70
Alkoxyated primary fatty alcohol	0.1—10	75
Ethoxylated alcohol adduct	20—90	
Polyethylene glycol	0.1—10	
Sodium sulfate, Perfume, Dye	Sufficient to make up to 100%	80

Such solid cleaning formulations exhibit bacteriostatic properties against *S. aureus*, *P. mirabilis* and *E. coli* at levels as low as 0.1 per million of the antimicrobial.

A preferred formula for an effective solid

cleaning and bacteriostatic composition is as follows:

	Ingredient	% By Weight
5	5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol (97% minimum activity)	1—3
	Alkoxyated primary fatty alcohol	2—8
10	Ethoxylated alcohol adduct	25—35
	Polyethylene glycol	2—8
	Sodium sulfate, Perfume, Dye	Sufficient to make up to 100%

15 Preferred examples of alkoxyated primary alcohols that are useful in this invention are those wherein the alkyl chain length is primarily C_{12} to C_{18} ; e.g. a mixture containing 50% of the ethylene oxide adduct and 10% of the propylene oxide adduct of a primary fatty alcohol whose alkyl chain contains 12 to 15 carbon atoms, the remaining 40% being primary fatty alcohol. Examples of the normally solid ethoxylated alcohol adducts are those where the primary alcohol chain length is about C_{16} to C_{20} . Preferably the polyethylene glycol has a molecular weight about 6000.

30 This invention also includes a method for preventing the growth or multiplication of microbiological organisms in toilet bowls which comprises adding a composition as hereinbefore described to a toilet bowl to prevent such growth.

35 In addition to the cleaning and bacteriostatic properties that the novel formulations of this invention possess, they also have the ability to reduce the surface tension of water.

40 As will be illustrated in the following examples, the solid compositions exhibit bacteriostatic properties at use levels as low as 0.1 parts per million of the anti-microbial. The examples will also indicate that anti-microbial agents known in the prior art are ineffective against the whole of the range of micro-organisms tested.

45 The following Example 1 illustrates the above described invention. The bacteria employed as the test organisms are representative of both gram negative and gram positive bacteria. The test procedure employed is the Agar Plate Test and the Agar Cup Plate Test as described in U.S.D.A. circular No. 198, 1931. The results are reported as zones of inhibition and measured in millimeters. Examples 2 and 3 are comparative examples.

EXAMPLE 1

60 This example illustrates a solid formulation of this invention which is suitable as a toilet bowl cleaner. The use dilution for microbiological activity with this composition is 0.30 parts per million of the formulation per 23,000 parts of water.

Component	% By Weight	65
100 moles of a normally liquid ethylene oxide adduct of a primary alcohol whose carbon length is C_{16} — C_{20}	31.00	70
Polyethylene Glycol (molecular weight about 6,000)	5.00	
A normally solid 50% ethylene oxide } adduct 10% propylene oxide }		75
of a primary fatty alcohol whose linear carbon chain length is C_{12} — C_{18} ; the remaining 40% being primary fatty alcohol	5.00	80
5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol (97% minimum activity)	1.25	
Sodium Sulphate	55.25	85
Perfume, Dye	Sufficient to make up to 100%	

Average Zone of Inhibition (mm)

Agar Cup Plate Test

S. aureus	E. coli	P. mirabilis	90
4.5	2	2.5	

EXAMPLE 2

Component	% By Weight	
Ethoxylated Alcohol Adduct	31.00	95
Polyethylene Glycol (mol. weight about 6000)	5.00	
Oxyethylated Alcohol Surfactant	5.00	
4',5 - Dibromosalicylanilide, 3,4',5 Tribromosalicylanilide (1:1 mixture)	2.50	100
Sodium Sulphate	54.00	
Perfume, Dye	Sufficient to make up to 100%	

Average Zone of Inhibition (mm)

Agar Cup Plate Test

S. aureus	E. coli	P. mirabilis	105
2.5	0	0	

This example illustrates the use of an anti-microbial agent which does not exhibit activity in the composition against *E. coli* and *P. mirabilis*.

EXAMPLE 3

Component	% By Weight	
Ethoxylated Alcohol Adduct	31.00	115
Polyethylene Glycol (mol. weight about 6000)	5.00	
Oxyethylated Alcohol Surfactant	5.00	
3,4',5 Tribromosalicylanilide	2.50	120
Sodium Sulphate	54.00	
Perfume, Dye	Sufficient to make up to 100%	

Average Zone of Inhibition (mm)		
Agar Cup Plate Test		
S. aureus	E. coli	P. mirabilis
0	0	0

- 5 This example illustrates a total lack of activity of an anti-microbial in the composition.

EXAMPLE 4

The following data represents the ability of the preferred compositions of this invention to help retard stain build-up on ceramic surface immersed in a solution containing an iron salt. Results are reported as units of stain pickup on white ceramic tiles. Less than 1 unit difference is visible to the naked eye. 10 15

		Average Units Iron Stain Pickup	Surface Tension Dynes/CM
20	Composition (Example 1)	2.5	33
	Water	6.1	72

WHAT WE CLAIM IS:—

1. A solid antibacterial composition which comprises 1 to 3% by weight of 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol; 20 to 90% by weight of a normally solid ethoxylated alcohol adduct; 0.1 to 10% by weight of a normally liquid alkoxyated primary fatty alcohol; 0.1 to 10% by weight of a polyethylene glycol; and sodium sulphate. 25

2. A solid antibacterial composition as claimed in Claim 1 also including a dye and perfume. 30

3. A composition as claimed in Claim 1 which comprises 25 to 35% by weight of the ethoxylated alcohol adduct. 35

4. A composition as claimed in Claim 1 or Claim 3 which comprises 2 to 8% by weight of the alkoxyated fatty alcohol.

5. A composition as claimed in any one of Claims 1, 3 and 4 which comprises 2 to 8% by weight of the polyethylene glycol. 40

6. A composition as claimed in Claim 2 which consists of 1 to 3% by weight of 5 - chloro - 2 - (2,4 - dichlorophenoxy) phenol; 25 to 35% by weight of an ethoxylated alcohol adduct; 2 to 8% by weight of an alkoxyated primary fatty alcohol; 2 to 8% by weight of a polyethylene glycol; and the remainder consisting of sodium sulphate, perfume and dye. 50

7. A composition as claimed in any one of Claims 1 and 3 to 5 in which the alkyl chain in the alkoxyated primary fatty alcohol contains 12 to 18 carbon atoms. 55

8. A composition as claimed in Claim 7 in which the alkoxyated primary fatty alcohol is a mixture of 50% of the ethylene oxide adduct and 10% of the propylene oxide adduct of a linear alcohol whose alkyl chain contains 12 to 15 carbon atoms; the remaining 40% being primary fatty alcohol. 60

9. A composition as claimed in any one of Claims 1, 3 to 5, 7 and 8 in which the polyethylene glycol has a molecular weight of approximately 6000. 65

10. A composition as claimed in any one of Claims 1, 3 to 5 and 7 to 9 in which the ethoxylated alcohol adduct is an ethylene oxide adduct of a primary alcohol whose carbon chain length is C_{16} to C_{20} . 70

11. A composition as claimed in Claim 2 or 6 in which the alkyl chain in the alkoxyated primary fatty alcohol contains 12 to 18 carbon atoms.

12. A composition as claimed in Claim 11 in which the alkoxyated primary fatty alcohol is a mixture of 50% of the ethylene oxide adduct and 10% of the propylene oxide adduct of a primary alcohol whose alkyl chain contains 12 to 15 carbon atoms, the remaining 40% being primary fatty alcohol. 75 80

13. A composition as claimed in any one of Claims 2, 6, 11 and 12 in which the polyethylene glycol has a molecular weight of approximately 6000. 85

14. A composition as claimed in any one of Claims 2, 6, 11, 12 and 13 in which the ethoxylated alcohol adduct is an ethylene oxide adduct of a primary alcohol whose carbon chain length is C_{16} to C_{20} . 90

15. A composition as claimed in Claim 2 substantially as hereinbefore described with reference to Example 1.

16. A method for preventing the growth or multiplication of microbiological organisms in toilet bowls which comprises adding a composition as claimed in any one of Claims 1, 3 to 5 and 7 to 10, to a toilet bowl to prevent such growth. 95

17. A method for preventing the growth or multiplication of microbiological organisms in toilet bowls which comprises adding a composition as claimed in any one of Claims 2, 6 and 11 to 15 to a toilet bowl to prevent such growth. 100 105

G. R. PORTER,
Chartered Patent Agent.

Average Zone of Inhibition (mm)		
Agar Cup Plate Test		
S. aureus	E. coli	P. mirabilis
0	0	0

- 5 This example illustrates a total lack of activity of an anti-microbial in the composition.

EXAMPLE 4

The following data represents the ability of the preferred compositions of this invention to help retard stain build-up on ceramic surface immersed in a solution containing an iron salt. Results are reported as units of stain pickup on white ceramic tiles. Less than 1 unit difference is visible to the naked eye.

	Average Units Iron Stain Pickup	Surface Tension Dynes/CM
20 Composition (Example 1)	2.5	33
Water	6.1	72

WHAT WE CLAIM IS:—

1. A solid antibacterial composition which comprises 1 to 3% by weight of 5 - chloro - 2 - (2,4 - dichlorophenoxy)phenol; 20 to 90% by weight of a normally solid ethoxylated alcohol adduct; 0.1 to 10% by weight of a normally liquid alkoxyated primary fatty alcohol; 0.1 to 10% by weight of a polyethylene glycol; and sodium sulphate.
2. A solid antibacterial composition as claimed in Claim 1 also including a dye and perfume.
3. A composition as claimed in Claim 1 which comprises 25 to 35% by weight of the ethoxylated alcohol adduct.
4. A composition as claimed in Claim 1 or Claim 3 which comprises 2 to 8% by weight of the alkoxyated fatty alcohol.
5. A composition as claimed in any one of Claims 1, 3 and 4 which comprises 2 to 8% by weight of the polyethylene glycol.
6. A composition as claimed in Claim 2 which consists of 1 to 3% by weight of 5 - chloro - 2 - (2,4 - dichlorophenoxy) phenol; 25 to 35% by weight of an ethoxylated alcohol adduct; 2 to 8% by weight of an alkoxyated primary fatty alcohol; 2 to 8% by weight of a polyethylene glycol; and the remainder consisting of sodium sulphate, perfume and dye.
7. A composition as claimed in any one of Claims 1 and 3 to 5 in which the alkyl chain in the alkoxyated primary fatty alcohol contains 12 to 18 carbon atoms.
8. A composition as claimed in Claim 7 in which the alkoxyated primary fatty alcohol is a mixture of 50% of the ethylene oxide adduct and 10% of the propylene oxide adduct of a linear alcohol whose alkyl chain contains 12 to 15 carbon atoms; the remaining 40% being primary fatty alcohol.
9. A composition as claimed in any one of Claims 1, 3 to 5, 7 and 8 in which the polyethylene glycol has a molecular weight of approximately 6000.
10. A composition as claimed in any one of Claims 1, 3 to 5 and 7 to 9 in which the ethoxylated alcohol adduct is an ethylene oxide adduct of a primary alcohol whose carbon chain length is C_{10} to C_{20} .
11. A composition as claimed in Claim 2 or 6 in which the alkyl chain in the alkoxyated primary fatty alcohol contains 12 to 18 carbon atoms.
12. A composition as claimed in Claim 11 in which the alkoxyated primary fatty alcohol is a mixture of 50% of the ethylene oxide adduct and 10% of the propylene oxide adduct of a primary alcohol whose alkyl chain contains 12 to 15 carbon atoms, the remaining 40% being primary fatty alcohol.
13. A composition as claimed in any one of Claims 2, 6, 11 and 12 in which the polyethylene glycol has a molecular weight of approximately 6000.
14. A composition as claimed in any one of Claims 2, 6, 11, 12 and 13 in which the ethoxylated alcohol adduct is an ethylene oxide adduct of a primary alcohol whose carbon chain length is C_{10} to C_{20} .
15. A composition as claimed in Claim 2 substantially as hereinbefore described with reference to Example 1.
16. A method for preventing the growth or multiplication of microbiological organisms in toilet bowls which comprises adding a composition as claimed in any one of Claims 1, 3 to 5 and 7 to 10, to a toilet bowl to prevent such growth.
17. A method for preventing the growth or multiplication of microbiological organisms in toilet bowls which comprises adding a composition as claimed in any one of Claims 2, 6 and 11 to 15 to a toilet bowl to prevent such growth.

G. R. PORTER,
Chartered Patent Agent.

