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DETERGENT SOLUTIONS

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ABSTRACT OF THE DISCLOSURE

The disinfecting activity of chlorhexidine or derivatives thereof when used in a detergent solution containing a betaine is maintained by adding urea or a derivative thereof to the detergent/disinfectant solution.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to detergent solutions which have a disinfectant action and is concerned specifically with those detergent solutions in which a guanidine derivative having disinfectant properties is provided.

DESCRIPTION OF THE PRIOR ART

The disinfecting activity of guanidine derivatives such as chlorhexidine, i.e. 1:6-di-(N_1-p-chlorophenyldiguanido-N_5) hexane, and the gluconate salt thereof are well known. The surface active properties of betaines are also well known. It has been found, however, that when a disinfectant such as chlorhexidine is mixed with a betaine, the disinfecting activity of the disinfectant is considerably reduced.

It is accordingly an object of the present invention to provide a detergent solution which includes, as disinfectant, chlorhexidine or a salt or derivative thereof and an activity-maintaining agent for maintaining the activity of the disinfectant when admixed with a surfactant.

SUMMARY OF THE INVENTION

Urea or an alkyl substituted urea is added to a detergent solution containing a betaine and a disinfectant selected from the group consisting of chlorhexidine, derivatives of chlorhexidine and the salts thereof to maintain the activity of the disinfectant.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred disinfectants are chlorhexidine and the polyhydroxy aliphatic carboxylic acid salts thereof such as the gluconate.

A preferred detergent solution comprises between 0.1% and 1.5% by weight of chlorhexidine or a salt thereof, between 1.0% and 15% by weight of a betaine and between 2% and 15% by weight of urea or an alkyl substituted urea. The preferred betaine is pendecamaine, i.e. N,N-dimethyl(3-palmitamido - propyl)aminoacetic acid. Chlorhexidine salts which can be used include chlorhexidine acetate and chlorhexidine hydrochloride. A thickening agent such as methyl or hydroxyethyl cellulose may be added and a sequestering agent such as ethylenediamine tetracetic acid may also be added. The detergent solution may also include a moisturising agent such as propylene glycol and/or a perfume or colourant.

More specific examples of the invention will now be described.

Two disinfectant solutions were prepared and disinfectant solution *a* contained 0.75% by weight chlorhexidine gluconate, 5% by weight of pendecamaine, 0.5% by weight of hydroxyethyl cellulose and 10% by weight urea. Solution *b* contained the same amount of chlorhexidine gluconate, pendecamaine and hydroxyethyl cellulose but no urea was included in the composition.

Samples of solution *a* and of solution *b* were added to test samples containing a gram-negative organism such as pseudomonas aeruginosa and samples were then taken from the solution of organisms and disinfectant and these samples were then exposed and tested for micro-organism growth. It was found that, using solution *a*, a 10 minute treatment of the micro-organisms with the disinfectant solution was sufficient to prevent growth of the micro-organisms whereas, with solution *b*, i.e. without the urea, a treatment time of at least 1 hour was necessary to prevent growth of the micro-organisms.

In a further test a solution *c* was prepared and this included 0.5% by weight chlorhexidine gluconate, 10% by weight of pendecamaine, 0.5% of hydroxyethyl cellulose and 5% by weight of urea it was found that, by increasing the amount of the pendecamaine and reducing the amount of chlorhexidine gluconate, the time for which the micro-organisms had to be treated with the disinfectant to obtain no growth conditions was reduced.

Tests carried out using other chlorhexidine compounds such as chlorhexidine itself and chlorhexidine acetate and using other betaines show that, when urea or a substituted urea and preferably a lower alkyl substituted urea such as dimethyl urea or diethyl urea, the length of the treatment time required to obtain no growth conditions is considerably reduced as compared with the conditions obtained when the urea or derivative thereof is not added.

In general it has been found that the disinfecting activity of the chlorhexidine gluconate or other chlorhexidine derivative is substantially the same as it would be in the absence of the betaine detergent. The disinfectant/detergent compositions of the present invention are intended to be used instead of the hexachlorophene disinfectant/detergent compositions at present in use. A major disadvantage of hexachlorophene based detergent compositions is that gram-negative organisms are either not affected or growth thereof is merely prevented. The chlorhexidine derivatives have a wider range of activity than the hexachlorophene based compositions. A further disadvantage of the hexachlorophene based detergents is that hexachlorophene is most active when used in combination with an alkaline soap and it has been found that alkaline detergents have a greater tendency to cause skin irritation than acid detergents. Skin has a pH of the order of 5 to 5.5 and a preferred pH of the chlorhexidine based detergents is thus of the same order.

In a further example of the present invention a detergent solution was prepared by firstly producing a gel from 0.5 part by weight of hydroxyethyl cellulose and water. Ten parts by weight of urea were dissolved in water and the urea solution mixed with the gel of the hydroxyethyl cellulose. 1.5 parts by weight of propylene glycol was then added to this mixture, followed by 5.0 parts by weight of pendecamaine and 0.75 part by weight of chlorhexidine gluconate. 0.005 part by weight of a perfume were then added and an appropriate amount of a colourant added and the total solution made up with water to 100 parts by weight. The pH of the solution is adjusted so as to be approximately 6.5.

A testing procedure was then carried out to establish the efficiency of the above detergent/disinfectant composition. Tests were carried out on a number of subjects and the procedure was as follows:

(1) The subjects rinse their hands for 10 seconds under running tap water and dry them on a sterile towel.

(2) The subjects then rinse their hands using 100 mils of a standard sterile rinse solution which consists of a quarter strength "ringers" solutions and the rinsing procedure is standardised as follows:

The hands are wetted with the rinse solution. They are then rubbed together palm to palm with three strokes. The left hand palm is then used to rub the back of the right hand with three strokes, whilst at the same time the fingers are interlaced. The right palm is then used to rub the back of the left hand in the same way. The rinse solution is drained into a container and a one mil sample of it is transferred to a culture plate whilst a series of 10 fold dilutions is also made, one mil samples of each being transferred to culture plates.

(3) The subject then washed the hands with three to four mils of the detergent/disinfectant solution set out above rapidly to remove traces of the rinse solution and dries then on a sterile towel.

(4) About 7 mils of the detergent/disinfectant solution as set out above are then added to the dry hands and the composition is massaged into the skin for 2 minutes, particular attention being paid to the areas around the finger nails. Tap water is then added and the hands washed for about 15 seconds. They are then dried on a sterile towel.

(5) The rinse procedure as set out at 2 above is repeated.

(6) During the following 24 hours the hands are treated as at 4 above 8 times, and at all other times when social washing is carried out, the detergent/disinfectant solution of the invention is used in place of soap.

(7) After the 8th treatment, the rinse procedure as at 2 above is again carried out.

For some of the subjects the procedure as set out at 4 above is effected 8 times a day for 7 days after which the rinse procedure as per step 2 is again carried out.

After incubation the number of colonies per plate are mounted and the counts obtained are shown on the following chart. In each case sample 1 is the sample obtained after the first rinsing, i.e. before any treatment with the detergent/disinfectant solution of the present invention. Sample 2 is the sample obtained after washing once with the detergent/disinfectant solution of the present invention, sample 3 is the sample obtained after 24 hours treatment and sample 4 is the sample obtained after 7 days treatment. The letters TNTC indicates that the number of organisms incubated was too numerous to count.

CHART

Subject	Sample	Neat	10^{-1}	10^{-2}	10^{-3}	10^{-}
1	1	TNTC	TNTC	118	13	
	2	TNTC	760	84	8	
	3	1,200	130	12	2	
	4	54	6	1		
2	1	TNTC	TNTC	600	61	8
	2	TNTC	720	88	11	2
	3	264	25	1		
	4	89	12	1		
3	1	2,000	208	24	2	
	2	1,100	112	14		
	3	400	38	5		
	4	61	5			
4	1	1,600	154	17	2	
	2	147	14	3		
	3	23	2			
5	1	TNTC	TNTC	352	28	5
	2	1,400	141	33	6	
	3	220	21	3		

The results above show the considerable disinfecting activity of the compositions of the present invention and the advantages that would be obtained by, for example, a surgeon continually using the composition are clearly demonstrated.

To ensure that any of the detergent/disinfectant composition which may remain on the hands does not prevent free growth of micro-organisms on the culture plate, the rinse solution contains inactivators. To show that these

inactivators are effective an inactivation control test has been carried out as follows: dilutions of staphylococcus aureus are prepared and one mil of this is added to 100 mils of inactivating solution containing 3.5 mils of the detergent/disinfectant solution prepared as set out above. One mil samples of the diluted staphylococcus aureus are also added to 100 mils of inactivating solution not containing the disinfectant/detergent solution. Samples are then taken from the inactivating solution with and without the detergent/disinfectant solution added and similar counts are obtained from both samples.

In the preferred detergent/disinfectant composition as set out above the chlorhexidine gluconate can be varied within the range of from 0.1% to 1.5%, the betaine can be varied between the range of from 0.1% to 15% and the urea can be varied within the range of from 2% to 15%.

The propylene glycol acts as a humectant or moisturising agent and assists in keeping the solution clear. The cellulose derivative acts as a thickening agent.

Ethylenediaminetetracetic acid or derivatives thereof can be added and it has been found that the addition of ethylenediaminetetracetic acid or derivatives thereof improves the bacteriological effect of the disinfectant but the addition thereof has the disadvantage that there is an increased tendecy to skin irritation. If ethylenediaminetetracetic acid or a derivative thereof is to be added, the amount thereof will normally be between 0.1% and 0.5% by weight.

I claim:

1. An aqueous detergent solution consisting essentially of between 0.1% and 1.5% by weight of a disinfectant selected from the group consisting of 1:6-di-(N_1-p-chlorophenyldiguanido-N_5) hexane and the gluconate and acetate salts thereof, between 1.0% and 15% by weight of N,N-dimethyl (3-palmitamido-propyl) aminoacetic acid, and between 2% and 15% by weight of an activity-maintaining agent selected from the group consisting of urea and lower alkyl substituted ureas for maintaining the disinfecting activity of the disinfectant.

2. A detergent solution according to claim **1** wherein the amount by weight of disinfectant in the detergent solution is between 0.5% and 0.75% by weight.

3. A detergent solution according to claim **1** in which the amount by weight of said N,N-dimethyl (3-palmitamido-propyl)aminoacetic acid is between 5% and 10% by weight.

4. A detergent solution according to claim **1** wherein the amount by weight of the activity-maintaining agent is between 5% and 10% by weight.

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