This Sheet Has Been Replace

REPLACED SHEETS SG
Description : paged ...1... to paged ...6...
Claim(s) : paged ...4... to paged ...17...
Drawing(s) : paged ...11... to paged ...-...
Abstract : paged ...1... to paged ...-...
DATE OF RECEIPT .....

9605022-4

DESCRIPTION

ANTISEPTIC FLUIDS

TECHNICAL FIELD

The invention relates to dual purpose antiseptic fluids, which additionally to being effective skin disinfectants are also capable on drying to form skin protective film with residual antibacterial properties.

These antiseptic fluids, while primarily applied as skin disinfectants for pre- and post surgery, dermatological infections, burn treatment as well as first aid for superficial wounds, cuts and abrasions, offer the additional advantage of a temporary or longer lasting skin and wound dressing depending on the film forming polymer used, without impairing the normal physiological activity of the skin.

The invention also relates to medical, surgical and veterinary devices in particular to liquid applicators for antiseptic fluids to the human skin for medical, pre-and post surgical applications and first-aid

BACKGROUND ART

Antiseptic fluids are solutions of a substance of known antibacterial properties dissolved in a solvent such as water or a lower alcohol or mixture of both. The bactericidal substance is, after application, deposited directly onto the skin and can through its contact cause to persons known to have hypersensitive skin, or to be allergic, considerable discomfort through reddening, itching or other sensations.

It is desired, after disinfection of the skin prior to or after surgery, open wounds, cuts and abrasions and especially burns, that there is continuous protection against any reinfection provided by residual antibacterial action of the antiseptic fluid employed or by physical means such as the use of closely fitting bandages made from sterilised fabrics or both. Residual bactericidal properties are claimed by some commerically available disinfectants but these can be expected to be only of short duration. For example the residual antibacterial efficiency of the widely used quaternary ammonium compounds as disinfectants is greatly affected by the pH of normal healthy skin and the organic matter contained in its exuding fluids. There is also a reduction of deposited

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

bactericides due to removal by perspiration. The use of bandages made from various fabrics can be cumbersome, often interfering with the movement of the affected parts of the body, requiring frequent time-consuming changes.

In recent years wound dressings for use on superficial burns, cuts and abrasions as well as pre- and post surgical dressings of the skin have been developed, providing a clear plastic film over the affected areas. These plastic wound dressings, often referred to as "plastic bandages" are usually solutions of an acrylic or methacrylic co-polymer dissolved in a volatile non-aqueous organic solvent of low boiling point such as ethyl acetate, acetone, ethyl alcohol or methylene chloride or mixtures thereof, reducing drying time to a minimum.

Although they protect the treated areas through their coherent film formation acting as a physical barrier against outside contamination and possible infection, they have no antibacterial activity and should therefore only be applied after disinfection of the skin. A serious disadvantage of these liquid bandages is that the non-aqueous solvent for the film forming polymer can cause considerable pain if applied to open wounds, cuts and abrasions. For good adherence, such liquid bandages can only be applied to perfectly dry skin. This makes them less suitable where the skin is contaminated by body fluids such as blood, strong perspiration or pus. Furthermore, these liquid bandages suffer from the disadvantage that the film consisting of a non-porous water-insoluble polymer closes the pores of the skin hermetically, thus not allowing it to perform its normal physiological functions. Modifications of such films have been claimed to make them semi-permable to be better able to cope with the body fluids exuded from the skin.

More recently spray plastic bandages have been described, whereby the polymer is dissolved in an organic solvent or the propellant itself to form a film on the skin removable by washing with soap and water. A spray bandage is also described in Australian Patent No. 527 826 where the film consisting of a water insoluble polymer such as polybutylmethacrylate is dissolved in an organic solvent

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

containing a water soluble bactericide such as a quaternary ammonium compound and bacteriostat such as a chlorinated hydroxydiphenylether. It is claimed that the water soluble bactericide will be leached out from the polymeric film for the immediate disinfection of the skin and that the resulting porous film will subsequently allow sufficient humidity to pass through, for the remaining bacteriostat in its anhydrous medium to exert residual antibacterial activity.

There are also known antiseptic preparations being aqueous solutions of an iodine complex with poly(N-vinyl-2-pyrrolidinone), which after application leaves a film of the iodine complex on the skin. This film formation is only incidental to the disinfecting properties and because of the thinness of the film as it is removed immediately when in contact with moisture, it cannot be regarded as a protective wound dressing.

It is common practice to apply a fluid antiseptic to wounds, cuts, lacerations, burns and skin infections and in surgery before and after incision of the skin. A further widely used practice is to disinfect small skin areas before penetration by a hypodermic needle or insertion of a canule for intraveneous feeding or blood transfusion. The area of the skin to be disinfected is customarily either painted with a soft brush, swabbed by means of a swab or sponge made of a soft porous material dipped into an antiseptic fluid. In surgery, swabs are held either by a forcep or are attached to the end of a rigid handle as disclosed in US Patent No. 3 508 547. The antiseptic fluid is held in an open container and the swab dipped into its content, which is discarded after the operation, causing a waste of the larger part which remained unused. Furthermore, the swabs or sponges discarded after use could easily be mistakenly included in the swab count if contaminated with clotted blood or after use with an iodine disinfectant because of similarity of colour.

An improvement in the art is disclosed in US Patent No. 3 774 609, combining a spongelike applicator with a rigid container for storing the antiseptic solution. The applicator sponge overlying the front end of the applicator is surrounded by a U-shaped clip including a pair of opposed pointed pins

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

piercing the container prior to application, allowing flow of its content into the applicator sponge. The device is discarded after only one single use. A similar but reusable device is claimed in US Patent No. 3 482 920, where the fluid applicator is held in a retaining ring with a piercing arrangment in the cap for opening the connecting rigid container and thus releasing the contained fluid to flow into the applicator.

In another US Patent No. 3 179 972, an applicator top being attached to a connecting bottle is described having a skin contacting surface of a microporous plastic material.

Common to all these devices is the fact that they allow only the use of low viscosity fluids capable of flowing freely by gravity alone from the container through the porous applicator on to its surface thus causing, when using the device when still full or nearly full, problems of liquid over-flow and run-off from treated skin areas. Furthermore, as some of the contents is used up and an equilibrium between outside air pressure and pressure inside the container is established, the antiseptic fluid will cease to flow into the applicator head and the device will have to be discarded with a large part of its content going to waste. There is also the risk, with the reduction of pressure inside the container of less antiseptic fluid flowing into the applicator head, which in turn, due to insufficient moistening might cause uneven application, leaving some skin areas untreated.

DESCRIPTION OF THE INVENTION

It has now been discovered that, when a water soluble or partially water soluble bactericide and/or bacteristat is dissolved or dispersed in an aqueous medium which may contain certain amounts of a volatile organic medium, such as ethanol, and a water soluble or water dispersible film forming polymer, on evaporation of the medium sufficient water is retained in the film for the bactericide and/or bacteristat to be effective. The film itself possesses residual antibacterial properties. This film, due to its moisture content does not interfere with the natural physiological functions of the skin.

It has further been surprisingly observed that with some individuals having highly sensitive skin to some bactericides

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

and bacteristats, no adverse, or considerably reduced adverse skin reactions such as reddening of the skin or itching occur, although a dressing containing such agents is left in contact with the skin for many hours.

The present invention thus relates to a dual purpose antiseptic fluid which additionally to being a liquid disinfectant for broken and unbroken skin, open wounds, burns, cuts and abrasions, leaves a protective dressing in form of an elastic film over the treated areas with residual antibacterial properties.

The dual purpose antiseptic fluid of the invention, after disinfection provides an elastic dressing which does not interfere with the normal physiological activity of the skin and is removable with water or with soap and water.

The antiseptic fluid of the invention causes a minimum or irritancy to sensitive skin otherwise caused by the direct contact and deposition of the bactericide and/or bacteristat direct onto the skin.

The invention also relates to a simple, reusable device for the application of the antiseptic fluid in an economic and effective manner to surfaces such as skin.

The invention therefore provides a dual-purpose antiseptic fluid comprising at least one bactericide and/or bacteristat at least one water-soluble or water-dispersable film forming polymer and water.

The fluid of the invention may optionally contain a water miscible, non-toxic volatile co-solvent such as a lower alcohol, e.g. ethanol, isopropanol, or the like.

The use of a slow drying solvent in such antiseptic fluids allows sufficient time for the active ingredients to act as in any other antiseptic fluid to assure complete disinfection of the treated skin area. It is generally accepted that for efficient skin disinfection, the composition should be in contact with the skin for about 30 to about 90 seconds. For practical purposes however, the drying time of the solvent should be adjusted by the addition of the appropriate quantity of a water miscible volatile co-solvent such as ethanol or isopropanol, so that film forming takes place preferably between about 30 and about 60 seconds. It is

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

also preferred that the concentration of the active ingredient is sufficient to achieve complete disinfection of the skin during film formation.

For certain purposes the co-solvent content might be raised as high as 70% by volume to reduce drying time to a few seconds only. The additional bactericidal power of co-solvents such as ethanol at this concentration assures asepsis of the skin even within the reduced drying time.

For the more widely used dual purpose antiseptic fluids of the invention, especially those for general household first aid, it is preferred that no unpleasant stinging sensation is experienced on application to broken skin, cuts and abrasions due to too high a content of co-solvent such as ethanol.

For application to burns it might be desired to include a topical local anaesthetic to reduce pain.

A distinct advantage of the dual purpose antiseptic fluid of the invention containing a water-retaining film forming polymer is that after disinfection of the skin, not only residual antibacterial activity is maintained, but that it is directed simultaneously against the outside environment and the skin. Thus, even if a slow acting bacteristat is employed, disinfection of the skin is continued even if the film has been formed before asepsis of the skin has been achieved. There is also the important added advantage that after normal disinfection of the skin the remaining bacterial flora residing in the depth of the skin tissue, often protected by fatty matter, and brought to the surface at a later time by perspiration, is destroyed on contact with the active ingredient in the film. It is therefore an important application of the present invention to provide an "invisible antiseptic glove" as an additional safeguard not only for surgeons' hands under the surgical glove against possible puncturing or cuts of the glove by surgical instruments, but also to serve as a temporary surgical glove for small emergency operations in the field.

The observed reduction and even elimination of skin irritation of persons known to have sensitive skin to the chemical agent employed as a bactericide and/or bacteristat, for example, quaternary ammonium compounds, can reasonably be

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

understood, as, on dissolving the film forming polymer, a protective colloid is formed around the molecule of the bactericide, and which without interfering with its antibacterial activity is preventing its direct contact with the skin not only during disinfection but even more so once film forming has set in.

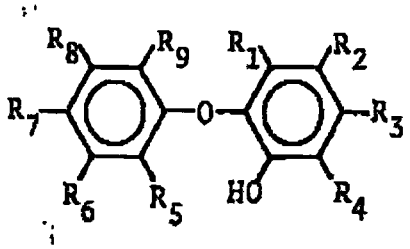
Another advantage of the protective colloid and the film formation around the molcule of the bactericide is that the possible deactivation through organic matter is reduced and residual antibacterial activity is increased. The use of a water soluble polymer has the further advantage that by selecting polymers of sufficient high molecular weight, the viscosity of the antiseptic fluid can be adjusted to be sufficiently high as to avoid unnecessary and annoying run-off after application.

It is advisable to incorporate small amounts of a plasticiser to increase the flexbility of the film. Such plasticisers are for example the polyethylene glycols or a surface active substance such as the nonylphenolpolyethoxy condensates to assure even spreading of the antiseptic fluid on the skin prior to filmformation in emergencies on unwashed skin and those people whose skin is oily or fatty.

The fluids of the invention optionally may contain a moisturiser. This is especially useful to enhance the moisture retaining properties of the polymeric film. Some moisturises may additionally act as a plasticiser. Examples of suitable moisturisers include glycerol, sorbitol, diethylene glycol, polyethylene glycol 400 and nonionic lanolin derivatives.

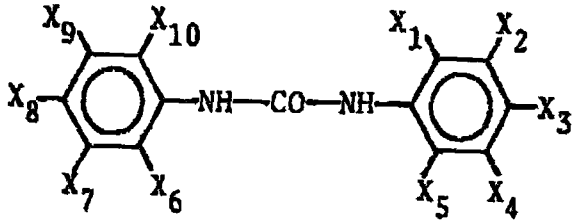
Suitable bactericides and bacterisetats which may be employed in compositions of the invention include halogenated hydroxydiphenyl derivatives or halogenated salicyl and carbanilides.

Examples of these bactericides and/or bacteristats are those of the formula

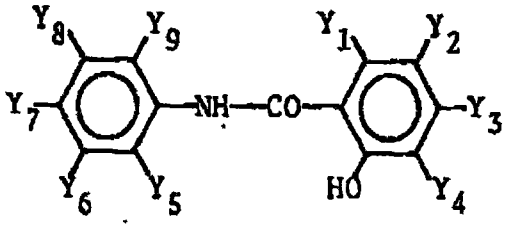


THIS SHEET HAS BEEN REPLACED

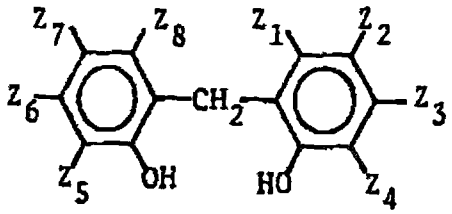
wherein each of R_1 to R_9 may be hydrogen, halogen, lower alkyl, halolowеralkyl, lower alkoxy, allyl, cyano, amino or acetyl and the O-acyl derivatives thereof provided that at least one of R_1 to R_9 is halogen:



wherein each of X_1 to X_{10} may be hydrogen, halogen, haloalkyl, nitro or alkoxy provided that at least one of X_1 to X_9 is halogen:



wherein each of Y_1 to Y_9 is hydrogen or halogen, provided that at least two of Y_1 to Y_9 are halogen; and



This Sheet Has Been Replaced

wherein each of Z_1 to Z_8 may be hydrogen or halogen provided that there is at least two halogen substituents on each Phehyl ring.

Such compounds are disclosed in Australian Patents Nos. 200 868, 209 986, 236 460, 273 941, 278 661 and 283 658 and in US Patents Nos. 2 250 840, 2 967 885, 3 254 121, 3 057 920 and 3 064 048.

Examples of the preferred bactericides and/or bacteristats include 2,4,4'-trichloro-2'-hydroxydiphenyl ether (triclosan); 2,2'-dihydroxy-3,3',5,5',6,6'-hexachlorodiphenylmethane systematic name (hexachlorophene); 3,5,4'-tribromosalicylanilide (tribromsalan), 3,4,4'-trichloro- or 3-trifluoromethyl-4,4'-dichloro-carbanilides (triclocarban and cloflucarban), chlorhexidine digluconate, cetyl trimethylammonium bromide, benzalkonium

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

chloride and iodine complexes known as iodophors.

The concentration of the active ingredient should be within the range recommended by the manufacturers, and be no different to those used in standard antiseptic solutions.

The film forming polymers, which provide films with sufficient water retention to allow for bactericidal bacteristatic activity of the incorporated active ingredients are, for example, methylcellulose, ethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose, carboxymethylcellulose and its alkali metal salts and partial salts with 2-aminomethylpropanol, diethylaminopropylamine and triisopropanolamine; copolymers of N-vinyl-2-pyrrolidinone with vinyl acetate, vinyl propionate, crotonic acid, long chain α-olefins, alkylaminoacrylates and methacrylates; copolymers of vinyl acetate with crotonic acid; terpolymers of N-vinyl-2-pyrrolidinone with vinyl acetate and vinyl propionate, or with vinyl acetate and alkylamioacrylates or methacrylates; quarternised copolymers of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate; poly(methyl vinyl ether-maleic anhydride); and polymers having free carbonyl groups.

Most suitable are the film forming polymers containing free carboxyl groups in their molecules, especially in the form of more water soluble salts. On contact of their films with the acid pH of normal skin, these groups are soon reconverted into the original carboxy groups, making the film less soluble by perspiration and outside humidity. They are however easily removed by washing with soap and water, as even the light of alkalinity of normal toilet soaps is sufficient to convert the carboxy groups into their more soluble salt group. Suitable polymers are for example co-polymers of vinyl acetate and crotonic acid, ter-polymers of N-vinyl-2-pyrrolidinone with vinyl acetate and alkylaminoacrylates or methacrylates.

Suitable polymers are also methylcellulose, ethylhydroxycellulose or hydroxymethylcellulose or ethylcellulose. On choosing a suitable grade, used in conjunction with a povidone-iodine or a povidone-iodine copolymer, they have the added advantage that viscous,

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

non-running fluids are obtained allowing an even covering of well defined areas of the skin, resulting in a longer lasting antiseptic protective film against post-operative infections, with higher resistance against abrasions when applied under plaster casts and bandages than was hitherto possible to obtain. Where N-vinyl-2-pyrrolidinone is a co-monomer, the co-polymer can be directly complexed with iodine using the poly(N-vinyl-2-pyrrolidinone) component to serve as the iodine carrier.

Similarly, the water soluble alkali metal salts of carboxymethylcellulose can be used in conjunction with other polymeric film forming substances at a pH preferably between 7.0 and 8.0, but not much below pH 6.0. Due to their ionic character care has to be taken in the choice of the bactericides being part of the composition as to their compatibility. Thus they cannot be used in conjunction with cationic substances such as quaternary ammonium compounds.

Suitable examples of substances for partial salt formation of these polymers to render them more hydrophilic or even completely watersoluble are: 2-aminomethylpropanol, diethylaminopropylamine and tri-isopropanolamine.

The dual purpose antiseptic fluids according to this invention are suitably applied by any conventional method such as painting, swabbing or dabbing onto the skin or by means of a suitable applicator.

In a further embodiment, the invention provides apparatus for applying a fluid to a surface, which apparatus comprises a container for said fluid defining a reservoir, an applicator head in fluid communication therewith, fluid flow restricting means between said reservoir and said applicator head, first cap means associated with said container for filling with fluid and second cap means for said applicator head to prevent evaporation of fluid therefrom, wherein said applicator head comprises a resilient porous pad held in a dome shaped cap in content with said fluid flow restricting means.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a representation of an applicator suitable for employing with the antiseptic fluids of the invention.

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

Figure 2 is an enlarged cut-away view of the applicator head depicted in Figure 1.

MODES FOR CARRYING OUT THE INVENTION

The antiseptic fluids of the invention may be applied by various known means such as spraying, swabbing, dipping, painting and the like.

The fluids may also be applied from an applicator of the type depicted in the drawings. Such an applicator (1) is made up of a reservoir (2) for antiseptic fluid and has an outer cap (3) which may incorporate a clip (4) so that the applicator can be carried securely in a pocket or the like.

The reservoir (2) is closed with a perforated shaped cap (5) covered with a resilient pourous pad (6) and held in place by a collar (7).

The pad (6) is preferably made of a synthetic resilient plastic material such as open polyurthane foam, multilayers of finely woven cotton cloth or absorben felt. The pad (6) is held over a perforated dome shaped cap (5) clipped in place allowing through flow of the antiseptic fluid. For the cap (5) a rigid plastic material unaffected by the antiseptic fluid is to be selected. Suitable plastic materials are polyvinylchloride, polyethylene and propylene, styrene and similar polymeric materials. The perforation of the cap (5) is such that the pad (6) is evenly moistened, preferably by a number of small symmetrically placed holes. The size of the perforations depending on the viscosity of the fulid is to be such that by inverting the applicator (1) no gravity feed into the pad occurs and a small amount of pressure on the reservoir (2) is needed for the necessary amount of fluid to moisten it. The applicator, when not in use, is hermetically closed by a removable outer cap (3) which either screws or clips on, made of a similar material as the perforated dome-shaped cap (5). This assures that any vapours from the antiseptic fluid cannot escape, thus keeping the pad (6) continuously moist. This assures the the device not only being protected from outside contamination but being always ready for use since no drying of the surface can occur.

The reservoir (2) is suitably made from a resilient semi-rigid material such as high density polyethylene or

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

propylene, enabling the antiseptic fluid to flow when inverted into the pad (6) on applying pressure to the side walls. A preferred manner of filling the antiseptic fluid is by way of a flexible bag (not shown) which is connected to the perforated cap (5). In such a case, the semi-rigid reservoir (2) will incorporate an air-vent. Thus, as the antiseptic fluid is withdrawn from the flexible bag, the pressure of the air entering the reservoir (2) provides a continuous delivery of the antiseptic fluid to the pad (6) at the same rate as it is used up. The flexible bag may be made up from any suitable material such as polyethylene or propylene, nylon and the like.

The following examples illustrate preferred embodiments of the invention. They should not be construed as limiting the claims hereto. Unless otherwise indicated, the ingredients are combined by standard cold mixing processes.

In all examples pH adjustments were made with phosphoric acid or an organic acid such as citric or lactic acid or with a mild alkali such as trithanolamine.

EXAMPLE 1

First Aid Disinfectant and Dressing

iodine complex with N-vinyl-2-pyrrolidinone: vinyl acetate co-polymer, ratio 70:30, available iodine 10%	5.0g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 30:70	5.0g
nonylphenolpolyethoxy(14)condensate	0.1g
ethanol	30.0ml
water, dist to make	100.0ml

The iodine complex of the co-polymer was obtained by using published standard methods for complexing with poly(N-vinyl-2-pyrrolidinone).

THIS SHEET HAS BEEN REPLACED

EXAMPLE 2

First Aid Disinfectant and Dressing

chlorhexidine gluconate	0.05g
co-polymer of vinylacetate with crotonic acid	3.00g
polyethylene glycol 400	0.30g
ethanol	40.00mL
2-aminomethylpropanol	0.24g
water, dist. to make	100.00mL

This Sheet Has Been Replaced

The polymer was dissolved by adding it to the solvent mixture containing the chlorhexidine and the polyethylene glycol and sufficient quantity of the 2-aminomethylpropanol added to obtain solution. The pH was kept between 6 to 7.

The composition is suitable to be packed as an aerosol spray, using hydrocarbons as propellant.

Example 3

Antiseptic Prepping Fluid and Dressing

This fluid is useful for disinfection of the skin prior to insertion of a hypodermic needle, canule or general disinfection prior and post surgery:

povidone-iodine containing 10% available iodine	10.0g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 50:50	10.0g
polyvinylpyrrolidone K 90	2.0g
nonylphenolypolyethoxy(14)condensate	0.1g
polyethylene glycol 400	0.1g
water, dist. to make	100.0mL

EXAMPLE 4

Viscous Antiseptic Prepping Fluid

This fluid is useful as a non-running, viscous antiseptic fluid for surgical prepping and dressing:

povidone-iodine containing 10% available iodine	10.0g
hydroxyethylcellulose	1.0g
glycerol	1.0g
nonylphenolethoxylate	0.25g
water, dist. to make	100.0mL

The hydroxyethylcellulose grades of suitable viscosity properties should be selected to give sufficient viscosity so that a free-flowing, sufficiently viscous film forming fluid is obtained which is able to accurately delineate the defined areas of skin to which it is applied.

EXAMPLE 5

Antiseptic Spray Bandage

methylhydroxyethylcelluose	2.0g
chlorhexidine digluconate 20% solution	5.0mL

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

ethanol	40.0mL
carmoisine (Food Red 3) dye solution 1.0% w/v	0.1mL
water, dist. to make	100.0mL

The chlorhexidine digluconate was added after an aqueous solution of both polymers has been obtained. The solution was then coloured and the pH if necessary adjusted between 6.5-7.0

The methylhydroxyethylcellulose grades of suitable viscosity properties should be selected to give sufficient viscosity so that a free-flowing, sufficiently viscous film forming fluid is obtained which is able to accurately delineate the defined areas of skin to which it is applied.

EXAMPLE 6

Protective Film (Invisible Glove)

This fluid is useful as a protective film under surgeons' gloves or for emergency operations in the field:

chlorhexidine acetate	0.5g
ter-polymer of vinyl acetate, vinyl propionate and crotonic acid	6.0g
ethanol	70.0mL
2-aminomethylpropanol	0.5g
water, dist. to make	100.0mL

The method of preparation was the same as in Example 2. The fluid is applied by wetting the complete hand and letting the solvent evaporate before putting on surgical gloves. In case of emergencies where no gloves are available, the procedure is repeated twice.

Example 7

Antiseptic Dressing

This fluid is useful as an antiseptic fluid for certain light dermatological infections:

trichlorophenoxydiphenylether	0.2g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 20:80	8.0g
nonionic lanolin derivative	70.0mL
water, dist. to make	100.0mL

The trichlorohydroxydiphenylether was dissolved in the ethanol prior to mixing with the copolymer. The water was added as the final step.

THIS SHEET HAS BEEN REPLACED

Example 8

Antiseptic Skin Disinfectant and Dressing for Veterinary Application

Antarox VRO 20	5.0g
Antarox CO 880	3.0g
Tylopur MH 1000	2.0g
water to make	100.0mL

The Antarox products were added to the solution of the Tylopur. The pH was then adjusted to 4.5.

Antarox VRO 20 and Antarox Co 880 are from GAF Corp USA, Tylopur MH is a methyl hydroxyethylcellulose available from Hoechst AG,W. Germany.

Example 9

Film forming Teat Dip for Mastitis Prophylaxis

Antarox VRO 20	2.0g
Antarox Co 880	1.5g
Tylopur MH 100	2.0g
glycerol	7.0g
water to make	100.0mL

This fluid is manufactured as described in Example 8.

The pH is to adjusted to a pH 4 with phosphoric acid.

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced

CLAIMS

1. A dual purpose antiseptic fluid comprising at least one bactericide and/or bacteristatic, at least one water soluble or water dispersible polymer and water.

2. A fluid as defined in claim 1, further comprising at least one water miscible, non-toxic, volatile liquid.

3. A fluid as defined in claim 1 or claim 2, further comprising at least one topical local anaesthetic.

4. A fluid as defined in any one of claims 1 to 3, wherein the bactericide and/or bacterstatic is chlorhexidine digluconate, cetyl trimethylammonium bromide, benzalkonium chloride, triclosan, hexachlorophone, tribromsalan, triclocarban, cloflucarban, an iodophor or a mixture of two or more thereof.

5. A fluid as defined in any one of claims 1 to 4, further comprising at least one moisturiser.

6. A fluid as defined in claim 5, wherein the moisturiser is glycerol, sorbitol, diethylene glycol, polyethylene glycol, or a nonionic lanoline derivative.

7. A fluid as defined in any one of claims 1 to 6, wherein the polymer is methylcellulose, ethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose, carboxymethylcellulose and its alkali metal salts and partial salts with 2-aminomethylpropanol, diethylaminopropylamine and triisopropanolamine; copolymers of N-vinyl-2-pyrrolidinone with vinyl acetate, vinyl propionate, crotonic acid, long chain α-olefins, alkylaminoacrylates and methacrylates; copolymers of vinyl acetate with crotonic acid; terpolymers of N-vinyl-2-pyrrolidinone with vinyl acetate and vinyl propionate, or with vinyl acetate and alkylamioacrylates or methacrylates; quarternised copolymers of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate; poly(methyl vinyl ether-maleic anhydride); and polymers having free carbonyl groups.

8. A fluid as defined in claim 7, wherein the polymer is carboxymethylcellulose, a vinyl acetate-crotonic acid copolymer, a vinyl acetate-vinyl propionate-crontonic acid terpolymer, a vinyl acetate-N-vinyl-2-pyrrolidinone

* C L M S *

THIS SHEET HAS BEEN REPLACED

copolymer, a N-vinyl-2-pyrrolidinone-long chain α-olefin copolymer, a N-vinyl-2-pyrrolidinone-dimethylaminoethyl methacrylate copolymer, a poly (methyl vinyl ether-maleic anyhydride), or a quarternised copolymer of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate.

9. A fluid as defined in any one of claims 1 to 8, wherein the bactericide is iodophor.

10. A fluid as defined in any one of claims 1 to 8, wherein the polymer has N-vinyl-2-pyrrolidinone as a component thereof and wherein the bactericide is formed by complexing iodine therewith.

11. A fluid as defined in any one of claims 1 to 10, contained in an apparatus which comprises a container for said fluid defining a reservoir, an applicator head in fluid communication therewith, fluid flow restricting means between said reservoir and said applicator head, first cap means associated with said container for filling with fluid and second cap means for said applicator head to prevent evaporation of fluid therefrom, wherein said applicator head comprises a resilient porous pad held in a dome shaped cap in content with said fluid flow restricting means.

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

ABSTRACT

ANTISEPTIC FLUIDS

The invention relates to dual purpose antiseptic fluids, which additionally to being effective skin disinfectants are also capable on drying to form skin protective film with residual antibacterial properties. These antiseptic fluids, while primarily applied as skin disinfectants for pre- and post surgery, dermatological infections, burn treatment as well as first aid for superficial wounds, cuts and abrasions, offer the additional advantage of a temporary or longer lasting skin and wound dressing, depending on the film forming polymer used, without impairing the normal physiological activity of the skin.

The invention also relates to medical surgical, and veterinary devices in particular to liquid applicators for antiseptic fluids to the human skin for medical, pre-and post surgical applications and first-aid.

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

1/1

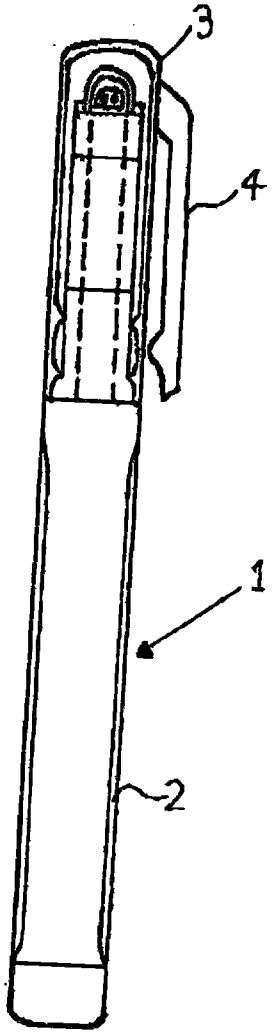


FIG. 1

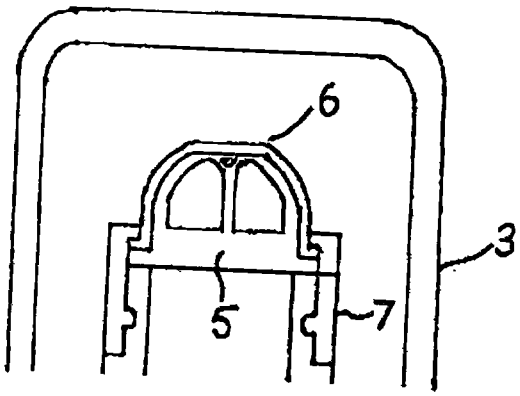


FIG. 2

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

REPLACEMENT SHEETS SG
Description : paged 1 to paged 15
Claim(s) : paged 16 to paged 17
Drawing(s) : paged 18 to paged —
Abstract : paged — to paged —
DATE OF RECEIPT 16/9/96

REPLACEMENT SHEET
18 SEP 1996

9605022-4

DESCRIPTION

ANTISEPTIC FLUIDS

TECHNICAL FIELD

The invention relates to dual purpose antiseptic fluids, which additionally to being effective skin disinfectants are also capable on drying to form skin protective film with residual antibacterial properties.

These antiseptic fluids, while primarily applied as skin disinfectants for pre- and post surgery, dermatological infections, burn treatment as well as first aid for superficial wounds, cuts and abrasions, offer the additional advantage of a temporary or longer lasting skin and wound dressing depending on the film forming polymer used, without impairing the normal physiological activity of the skin.

The invention also relates to medical, surgical and veterinary devices in particular to liquid applicators for antiseptic fluids to the human skin for medical, pre-and post surgical applications and first-aid

BACKGROUND ART

Antiseptic fluids are solutions of a substance of known antibacterial properties dissolved in a solvent such as water or a lower alcohol or mixture of both. The bactericidal substance is, after application, deposited directly onto the skin and can through its contact cause to persons known to have hypersensitive skin, or to be allergic, considerable discomfort through reddening, itching or other sensations.

It is desired, after disinfection of the skin prior to or after surgery, open wounds, cuts and abrasions and especially burns, that there is continuous protection against any reinfection provided by residual antibacterial action of the antiseptic fluid employed or by physical means such as the use of closely fitting bandages made from sterilised fabrics or both. Residual bactericidal properties are claimed by some commerically available disinfectants but these can be expected to be only of short duration. For example the residual antibacterial efficiency of the widely used quaternary ammonium compounds as disinfectants is greatly affected by the pH of normal healthy skin and the organic matter contained in its exuding fluids. There is also a reduction of deposited

REPLACEMENT SHEET
16 SEP 1996

bactericides due to removal by perspiration. The use of bandages made from various fabrics can be cumbersome, often interfering with the movement of the affected parts of the body, requiring frequent time-consuming changes.

In recent years wound dressings for use on superficial burns, cuts and abrasions as well as pre- and post surgical dressings of the skin have been developed, providing a clear plastic film over the affected areas. These plastic wound dressings, often referred to as "plastic bandages" are usually solutions of an acrylic or methacrylic co-polymer dissolved in a volatile non-aqueous organic solvent of low boiling point such as ethyl acetate, acetone, ethyl alcohol or methylene chloride or mixtures thereof, reducing drying time to a minimum.

Although they protect the treated areas through their coherent film formation acting as a physical barrier against outside contamination and possible infection, they have no antibacterial activity and should therefore only be applied after disinfection of the skin. A serious disadvantage of these liquid bandages is that the non-aqueous solvent for the film forming polymer can cause considerable pain if applied to open wounds, cuts and abrasions. For good adherence, such liquid bandages can only be applied to perfectly dry skin. This makes them less suitable where the skin is contaminated by body fluids such as blood, strong perspiration or pus. Furthermore, these liquid bandages suffer from the disadvantage that the film consisting of a non-porous water-insoluble polymer closes the pores of the skin hermetically, thus not allowing it to perform its normal physiological functions. Modifications of such films have been claimed to make them semi-permable to be better able to cope with the body fluids exuded from the skin.

More recently spray plastic bandages have been described, whereby the polymer is dissolved in an organic solvent or the propellant itself to form a film on the skin removable by washing with soap and water. A spray bandage is also described in Australian Patent No. 527 826 where the film consisting of a water insoluble polymer such as polybutylmethacrylate is dissolved in an organic solvent

REPLACEMENT SHEET
13 SEP 1996

containing a water soluble bactericide such as a quaternary ammonium compound and bacteriostat such as a chlorinated hydroxydiphenylether. It is claimed that the water soluble bactericide will be leached out from the polymeric film for the immediate disinfection of the skin and that the resulting porous film will subsequently allow sufficient humidity to pass through, for the remaining bacteriostat in its anhydrous medium to exert residual antibacterial activity.

There are also known antiseptic preparations being aqueous solutions of an iodine complex with poly(N-vinyl-2-pyrrolidinone), which after application leaves a film of the iodine complex on the skin. This film formation is only incidental to the disinfecting properties and because of the thinness of the film as it is removed immediately when in contact with moisture, it cannot be regarded as a protective wound dressing.

It is common practice to apply a fluid antiseptic to wounds, cuts, lacerations, burns and skin infections and in surgery before and after incision of the skin. A further widely used practice is to disinfect small skin areas before penetration by a hypodermic needle or insertion of a canule for intraveneous feeding or blood transfusion. The area of the skin to be disinfected is customarily either painted with a soft brush, swabbed by means of a swab or sponge made of a soft porous material dipped into an antiseptic fluid. In surgery, swabs are held either by a forcep or are attached to the end of a rigid handle as disclosed in US Patent No. 3 508 547. The antiseptic fluid is held in an open container and the swab dipped into its content, which is discarded after the operation, causing a waste of the larger part which remained unused. Furthermore, the swabs or sponges discarded after use could easily be mistakenly included in the swab count if contaminated with clotted blood or after use with an iodine disinfectant because of similarity of colour.

An improvement in the art is disclosed in US Patent No. 3 774 609, combining a spongelike applicator with a rigid container for storing the antiseptic solution. The applicator sponge overlying the front end of the applicator is surrounded by a U-shaped clip including a pair of opposed pointed pins

REPLACEMENT SHEET
18 SEP 1996

piercing the container prior to application, allowing flow of its content into the applicator sponge. The device is discarded after only one single use. A similar but reusable device is claimed in US Patent No. 3 482 920, where the fluid applicator is held in a retaining ring with a piercing arrangment in the cap for opening the connecting rigid container and thus releasing the contained fluid to flow into the applicator.

In another US Patent No. 3 179 972, an applicator top being attached to a connecting bottle is described having a skin contacting surface of a microporous plastic material.

Common to all these devices is the fact that they allow only the use of low viscosity fluids capable of flowing freely by gravity alone from the container through the porous applicator on to its surface thus causing, when using the device when still full or nearly full, problems of liquid over-flow and run-off from treated skin areas. Furthermore, as some of the contents is used up and an equilibrium between outside air pressure and pressure inside the container is established, the antiseptic fluid will cease to flow into the applicator head and the device will have to be discarded with a large part of its content going to waste. There is also the risk, with the reduction of pressure inside the container of less antiseptic fluid flowing into the applicator head, which in turn, due to insufficient moistening might cause uneven application, leaving some skin areas untreated.

DESCRIPTION OF THE INVENTION

It has now been discovered that, when a water soluble or partially water soluble bactericide and/or bacteristat is dissolved or dispersed in an aqueous medium which may contain certain amounts of a volatile organic medium, such as ethanol, and a water soluble or water dispersible film forming polymer, on evaporation of the medium sufficient water is retained in the film for the bactericide and/or bacteristat to be effective. The film itself possesses residual antibacterial properties. This film, due to its moisture content does not interfere with the natural physiological functions of the skin.

It has further been surprisingly observed that with some individuals having highly sensitive skin to some bactericides

This Sheet Has Been Replaced

REPLACEMENT SHEET
18 SEP 1991

THIS SHEET HAS BEEN REPLACED

and bacteristats, no adverse, or considerably reduced adverse skin reactions such as reddening of the skin or itching occur, although a dressing containing such agents is left in contact with the skin for many hours.

The present invention thus relates to a dual purpose antiseptic fluid which additionally to being a liquid disinfectant for broken and unbroken skin, open wounds, burns, cuts and abrasions, leaves a protective dressing in form of an elastic film over the treated areas with residual antibacterial properties.

The dual purpose antiseptic fluid of the invention, after disinfection provides an elastic dressing which does not interfere with the normal physiological activity of the skin and is removable with water or with soap and water.

The antiseptic fluid of the invention causes a minimum or irritancy to sensitive skin otherwise caused by the direct contact and deposition of the bactericide and/or bacteristat direct onto the skin.

The invention also relates to a simple, reusable device for the application of the antiseptic fluid in an economic and effective manner to surfaces such as skin.

The invention therefore provides a dual-purpose antiseptic fluid comprising at least one bactericide and/or bacteristat at least one water-soluble or water-dispersable film forming polymer and water.

The fluid of the invention may optionally contain a water miscible, non-toxic volatile co-solvent such as a lower alcohol, e.g. ethanol, isopropanol, or the like.

The use of a slow drying solvent in such antiseptic fluids allows sufficient time for the active ingredients to act as in any other antiseptic fluid to assure complete disinfection of the treated skin area. It is generally accepted that for efficient skin disinfection, the composition should be in contact with the skin for about 30 to about 90 seconds. For practical purposes however, the drying time of the solvent should be adjusted by the addition of the appropriate quantity of a water miscible volatile co-solvent such as ethanol or isopropanol, so that film forming takes place preferably between about 30 and about 60 seconds. It is

REPLACEMENT SHEET
18 SEP 1996

also preferred that the concentration of the active ingredient is sufficient to achieve complete disinfection of the skin during film formation.

For certain purposes the co-solvent content might be raised as high as 70% by volume to reduce drying time to a few seconds only. The additional bactericidal power of co-solvents such as ethanol at this concentration assures asepsis of the skin even within the reduced drying time.

For the more widely used dual purpose antiseptic fluids of the invention, especially those for general household first aid, it is preferred that no unpleasant stinging sensation is experienced on application to broken skin, cuts and abrasions due to too high a content of co-solvent such as ethanol.

For application to burns it might be desired to include a topical local anaesthetic to reduce pain.

A distinct advantage of the dual purpose antiseptic fluid of the invention containing a water-retaining film forming polymer is that after disinfection of the skin, not only residual antibacterial activity is maintained, but that it is directed simultaneously against the outside environment and the skin. Thus, even if a slow acting bacteristat is employed, disinfection of the skin is continued even if the film has been formed before asepsis of the skin has been achieved. There is also the important added advantage that after normal disinfection of the skin the remaining bacterial flora residing in the depth of the skin tissue, often protected by fatty matter, and brought to the surface at a later time by perspiration, is destroyed on contact with the active ingredient in the film. It is therefore an important application of the present invention to provide an "invisible antiseptic glove" as an additional safeguard not only for surgeons' hands under the surgical glove against possible puncturing or cuts of the glove by surgical instruments, but also to serve as a temporary surgical glove for small emergency operations in the field.

The observed reduction and even elimination of skin irritation of persons known to have sensitive skin to the chemical agent employed as a bactericide and/or bacteristat, for example, quaternary ammonium compounds, can reasonably be

REPLACEMENT SHEET
18 SEP 19

understood, as, on dissolving the film forming polymer, a protective colloid is formed around the molecule of the bactericide, and which without interfering with its antibacterial activity is preventing its direct contact with the skin not only during disinfection but even more so once film forming has set in.

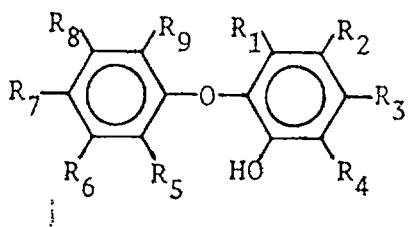
Another advantage of the protective colloid and the film formation around the molcule of the bactericide is that the possible deactivation through organic matter is reduced and residual antibacterial activity is increased. The use of a water soluble polymer has the further advantage that by selecting polymers of sufficient high molecular weight, the viscosity of the antiseptic fluid can be adjusted to be sufficiently high as to avoid unnecessary and annoying run-off after application.

It is advisable to incorporate small amounts of a plasticiser to increase the flexbility of the film. Such plasticisers are for example the polyethylene glycols or a surface active substance such as the nonylphenolpolyethoxy condensates to assure even spreading of the antiseptic fluid on the skin prior to filmformation in emergencies on unwashed skin and those people whose skin is oily or fatty.

The fluids of the invention optionally may contain a moisturiser. This is especially useful to enhance the moisture retaining properties of the polymeric film. Some moisturises may additionally act as a plasticiser. Examples of suitable moisturisers include glycerol, sorbitol, diethylene glycol, polyethylene glycol 400 and nonionic lanolin derivatives.

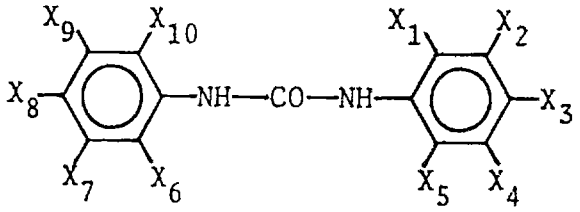
Suitable bactericides and bacterisetats which may be employed in compositions of the invention include halogenated hydroxydiphenyl derivatives or halogenated salicyl and carbanilides.

Examples of these bactericides and/or bacteristats are those of the formula

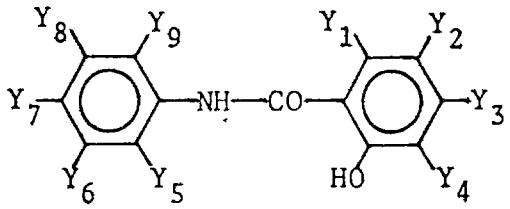


REPLACEMENT SHEET
18 SEP 1

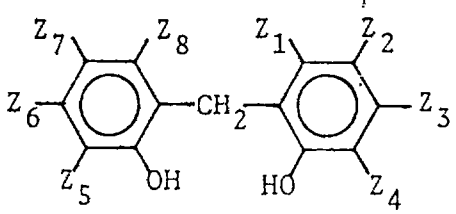
wherein each of R_1 to R_9 may be hydrogen, halogen, lower alkyl, haloloweralkyl, lower alkoxy, allyl, cyano, amino or acetyl and the O-acyl derivatives thereof provided that at least one of R_1 to R_9 is halogen:



wherein each of X_1 to X_{10} may be hydrogen, halogen, haloalkyl, nitro or alkoxy provided that at least one of X_1 to X_9 is halogen:



wherein each of Y_1 to Y_9 is hydrogen or halogen, provided that at least two of Y_1 to Y_9 are halogen; and



wherein each of Z, to Z_8 may be hydrogen or halogen provided that there is at least two halogen substituents on each Phehyl ring.

Such compounds are disclosed in Australian Patents Nos. 200 868, 209 986, 236 460, 273 941, 278 661 and 283 658 and in US Patents Nos. 2 250 840, 2 967 885, 3 254 121, 3 057 920 and 3 064 048.

Examples of the preferred bactericides and/or bacteristats include 2,4,4'-trichloro-2'-hydroxydiphenyl ether (triclosan); 2,2'-dihydroxy-3,3',5,5',6,6'-hexachlorodiphenylmethane systematic name (hexachlorophene); 3,5,4'-tribromosalicylanilide (tribromsalan), 3,4,4'-trichloro- or 3-trifluoromethyl-4,4'-dichloro-carbanilides (triclocarban and cloflucarban), chlorhexidine digluconate, cetyl trimethylammonium bromide, benzalkonium

REPLACEMENT SHEET
18 SEP 1996

chloride and iodine complexes known as iodophors.

The concentration of the active ingredient should be within the range recommended by the manufacturers, and be no different to those used in standard antiseptic solutions.

The film forming polymers, which provide films with sufficient water retention to allow for bactericidal bacteristatic activity of the incorporated active ingredients are, for example, methylcellulose, ethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose, carboxymethylcellulose and its alkali metal salts and partial salts with 2-aminomethylpropanol, diethylaminopropylamine and triisopropanolamine; copolymers of N-vinyl-2-pyrrolidinone with vinyl acetate, vinyl propionate, crotonic acid, long chain α-olefins, alkylaminoacrylates and methacrylates; copolymers of vinyl acetate with crotonic acid; terpolymers of N-vinyl-2-pyrrolidinone with vinyl acetate and vinyl propionate, or with vinyl acetate and alkylamioacrylates or methacrylates; quarternised copolymers of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate; poly(methyl vinyl ether-maleic anhydride); and polymers having free carbonyl groups.

Most suitable are the film forming polymers containing free carboxyl groups in their molecules, especially in the form of more water soluble salts. On contact of their films with the acid pH of normal skin, these groups are soon reconverted into the original carboxy groups, making the film less soluble by perspiration and outside humidity. They are however easily removed by washing with soap and water, as even the light of alkalinity of normal toilet soaps is sufficient to convert the carboxy groups into their more soluble salt group. Suitable polymers are for example co-polymers of vinyl acetate and crotonic acid, ter-polymers of N-vinyl-2-pyrrolidinone with vinyl acetate and alkylaminoacrylates or methacrylates.

Suitable polymers are also methylcellulose, ethylhydroxycellulose or hydroxymethylcellulose or ethylcellulose. On choosing a suitable grade, used in conjunction with a povidone-iodine or a povidone-iodine copolymer, they have the added advantage that viscous,

non-running fluids are obtained allowing an even covering of well defined areas of the skin, resulting in a longer lasting antiseptic protective film against post-operative infections, with higher resistance against abrasions when applied under plaster casts and bandages than was hitherto possible to obtain. Where N-vinyl-2-pyrrolidinone is a co-monomer, the co-polymer can be directly complexed with iodine using the poly(N-vinyl-2-pyrrolidinone) component to serve as the iodine carrier.

Similarly, the water soluble alkali metal salts of carboxymethylcellulose can be used in conjunction with other polymeric film forming substances at a pH preferably between 7.0 and 8.0, but not much below pH 6.0. Due to their ionic character care has to be taken in the choice of the bactericides being part of the composition as to their compatibility. Thus they cannot be used in conjunction with cationic substances such as quaternary ammonium compounds.

Suitable examples of substances for partial salt formation of these polymers to render them more hydrophilic or even completely watersoluble are: 2-aminomethylpropanol, diethylaminopropylamine and tri-isopropanolamine.

The dual purpose antiseptic fluids according to this invention are suitably applied by any conventional method such as painting, swabbing or dabbing onto the skin or by means of a suitable applicator.

In a further embodiment, the invention provides apparatus for applying a fluid to a surface, which apparatus comprises a container for said fluid defining a reservoir, an applicator head in fluid communication therewith, fluid flow restricting means between said reservoir and said applicator head, first cap means associated with said container for filling with fluid and second cap means for said applicator head to prevent evaporation of fluid therefrom, wherein said applicator head comprises a resilient porous pad held in a dome shaped cap in content with said fluid flow-restricting means.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a representation of an applicator suitable for employing with the antiseptic fluids of the invention.

REPLACEMENT SHEET
18 SEP 1996

Figure 2 is an enlarged cut-away view of the applicator head depicted in Figure 1.

MODES FOR CARRYING OUT THE INVENTION

The antiseptic fluids of the invention may be applied by various known means such as spraying, swabbing, dipping, painting and the like.

The fluids may also be applied from an applicator of the type depicted in the drawings. Such an applicator (1) is made up of a reservoir (2) for antiseptic fluid and has an outer cap (3) which may incorporate a clip (4) so that the applicator can be carried securely in a pocket or the like.

The reservoir (2) is closed with a perforated shaped cap (5) covered with a resilient pourous pad (6) and held in place by a collar (7).

The pad (6) is preferably made of a synthetic resilient plastic material such as open polyurthane foam, multilayers of finely woven cotton cloth or absorben felt. The pad (6) is held over a perforated dome shaped cap (5) clipped in place allowing through flow of the antiseptic fluid. For the cap (5) a rigid plastic material unaffected by the antiseptic fluid is to be selected. Suitable plastic materials are polyvinylchloride, polyethylene and propylene, styrene and similar polymeric materials. The perforation of the cap (5) is such that the pad (6) is evenly moistened, preferably by a number of small symmetrically placed holes. The size of the perforations depending on the viscosity of the fulid is to be such that by inverting the applicator (1) no gravity feed into the pad occurs and a small amount of pressure on the reservoir (2) is needed for the necessary amount of fluid to moisten it. The applicator, when not in use, is hermetically closed by a removable outer cap (3) which either screws or clips on, made of a similar material as the perforated dome-shaped cap (5). This assures that any vapours from the antiseptic fluid cannot escape, thus keeping the pad (6) continuously moist. This assures the the device not only being protected from outside contamination but being always ready for use since no drying of the surface can occur.

The reservoir (2) is suitably made from a resilient semi-rigid material such as high density polyethylene or

REPLACEMENT SHEET
18 SEP 1995

propylene, enabling the antiseptic fluid to flow when inverted into the pad (6) on applying pressure to the side walls. A preferred manner of filling the antiseptic fluid is by way of a flexible bag (not shown) which is connected to the perforated cap (5). In such a case, the semi-rigid reservoir (2) will incorporate an air-vent. Thus, as the antiseptic fluid is withdrawn from the flexible bag, the pressure of the air entering the reservoir (2) provides a continuous delivery of the antiseptic fluid to the pad (6) at the same rate as it is used up. The flexible bag may be made up from any suitable material such as polyethylene or propylene, nylon and the like.

The following examples illustrate preferred embodiments of the invention. They should not be construed as limiting the claims hereto. Unless otherwise indicated, the ingredients are combined by standard cold mixing processes.

In all examples pH adjustments were made with phosphoric acid or an organic acid such as citric or lactic acid or with a mild alkali such as trithanolamine.

EXAMPLE 1

First Aid Disinfectant and Dressing

iodine complex with N-vinyl-2-pyrrolidinone: vinyl acetate co-polymer, ratio 70:30, available iodine 10%	5.0g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 30:70	5.0g
nonylphenolpolyethoxy(14)condensate	0.1g
ethanol	30.0ml
water, dist to make	100.0ml

The iodine complex of the co-polymer was obtained by using published standard methods for complexing with poly(N-vinyl-2-pyrrolidinone).

EXAMPLE 2

First Aid Disinfectant and Dressing

chlorhexidine gluconate	0.05g
co-polymer of vinylacetate with crotonic acid	3.00g
polyethylene glycol 400	0.30g
ethanol	40.00mL
2-aminomethylpropanol	0.24g
water, dist. to make	100.00mL

REPLACEMENT SHEET
18 SEP 1996

The polymer was dissolved by adding it to the solvent mixture containing the chlorhexidine and the polyethylene glycol and sufficient quantity of the 2-aminomethylpropanol added to obtain solution. The pH was kept between 6 to 7.

The composition is suitable to be packed as an aerosol spray, using hydrocarbons as propellant.

Example 3

Antiseptic Prepping Fluid and Dressing

This fluid is useful for disinfection of the skin prior to insertion of a hypodermic needle, canule or general disinfection prior and post surgery:

povidone-iodine containing 10% available iodine	10.0g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 50:50	10.0g
polyvinylpyrrolidone K 90	2.0g
nonylphenolypolyethoxy(14)condensate	0.1g
polyethylene glycol 400	0.1g
water, dist. to make	100.0mL

EXAMPLE 4

Viscous Antiseptic Prepping Fluid

This fluid is useful as a non-running, viscous antiseptic fluid for surgical prepping and dressing:

povidone-iodine containing 10% available iodine	10.0g
hydroxyethylcellulose	1.0g
glycerol	1.0g
nonylphenolethoxylate	0.25g
water, dist. to make	100.0mL

The hydroxyethylcellulose grades of suitable viscosity properties should be selected to give sufficient viscosity so that a free-flowing, sufficiently viscous film forming fluid is obtained which is able to accurately delineate the defined areas of skin to which it is applied.

EXAMPLE 5

Antiseptic Spray Bandage

methylhydroxyethyicelluose	2.0g
chlorhexidine digluconate 20% solution	5.0mL

ethanol	40.0mL
carmoisine (Food Red 3) dye solution 1.0% w/v	0.1mL
water, dist. to make	100.0mL

The chlorhexidine digluconate was added after an aqueous solution of both polymers has been obtained. The solution was then coloured and the pH if necessary adjusted between 6.5-7.0

The methylhydroxyethylcellulose grades of suitable viscosity properties should be selected to give sufficient viscosity so that a free-flowing, sufficiently viscous film forming fluid is obtained which is able to accurately delineate the defined areas of skin to which it is applied.

EXAMPLE 6

Protective Film (Invisible Glove)

This fluid is useful as a protective film under surgeons' gloves or for emergency operations in the field:

chlorhexidine acetate	0.5g
ter-polymer of vinyl acetate, vinyl propionate and crotonic acid	6.0g
ethanol	70.0mL
2-aminomethylpropanol	0.5g
water, dist. to make	100.0mL

The method of preparation was the same as in Example 2. The fluid is applied by wetting the complete hand and letting the solvent evaporate before putting on surgical gloves. In case of emergencies where no gloves are available, the procedure is repeated twice.

Example 7

Antiseptic Dressing

This fluid is useful as an antiseptic fluid for certain light dermatological infections:

trichlorophenoxydiphenylether	0.2g
co-polymer of N-vinyl-2-pyrrolidinone: vinyl acetate, ratio 20:80	8.0g
nonionic lanolin derivative	70.0mL
water, dist. to make	100.0mL

The trichlorohydroxydiphenylether was dissolved in the ethanol prior to mixing with the copolymer. The water was added as the final step.

REPLACEMENT SHEET
18 SEP 1996

Example 8

Antiseptic Skin Disinfectant and Dressing for Veterinary Application

Antarox VRO 20	5.0g
Antarox CO 880	3.0g
Tylopur MH 1000	2.0g
water to make	100.0mL

The Antarox products were added to the solution of the Tylopur. The pH was then adjusted to 4.5.

Antarox VRO 20 and Antarox Co 880 are from GAF Corp USA, Tylopur MH is a methyl hydroxyethylcellulose available from Hoechst AG,W. Germany.

Example 9

Film forming Teat Dip for Mastitis Prophylaxis

Antarox VRO 20	2.0g
Antarox Co 880	1.5g
Tylopur MH 100	2.0g
glycerol	7.0g
water to make	100.0mL

This fluid is manufactured as described in Example 8.

The pH is to adjusted to a pH 4 with phosphoric acid.

REPLACEMENT SHEET
18 SEP 1996

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

CLAIMS

1. A dual purpose antiseptic fluid comprising at least one bactericide and/or bacteristatic; at least one water soluble or water dispersible polymer and water.

2. A fluid as defined in claim 1, further comprising at least one water miscible, non-toxic, volatile liquid.

3. A fluid as defined in claim 1 or claim 2, further comprising at least one topical local anaesthetic.

4. A fluid as defined in any one of claims 1 to 3, wherein the bactericide and/or bacterstatic is chlorhexidine digluconate, cetyl trimethylammonium bromide, benzalkonium chloride, triclosan, hexachlorophone, tribromsalan, triclocarban, cloflucarban, an iodophor or a mixture of two or more thereof.

5. A fluid as defined in any one of claims 1 to 4, further comprising at least one moisturiser.

6. A fluid as defined in claim 5, wherein the moisturiser is glycerol, sorbitol, diethylene glycol, polyethylene glycol, or a nonionic lanoline derivative.

7. A fluid as defined in any one of claims 1 to 6, wherein the polymer is methylcellulose, ethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose, carboxymethylcellulose and its alkali metal salts and partial salts with 2-aminomethylpropanol, diethylaminopropylamine and triisopropanolamine; copolymers of N-vinyl-2-pyrrolidinone with vinyl acetate, vinyl propionate, crotonic acid, long chain α-olefins, alkylaminoacrylates and methacrylates; copolymers of vinyl acetate with crotonic acid; terpolymers of N-vinyl-2-pyrrolidinone with vinyl acetate and vinyl propionate, or with vinyl acetate and alkylamioacrylates or methacrylates; quarternised copolymers of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate; poly(methyl vinyl ether-maleic anhydride); and polymers having free carbonyl groups.

8. A fluid as defined in claim 7, wherein the polymer is carboxymethylcellulose, a vinyl acetate-crotonic acid copolymer, a vinyl acetate-vinyl propionate-crontonic acid terpolymer, a vinyl acetate-N-vinyl-2-pyrrolidinone

REPLACEMENT SHEET
18 SEP 19

THIS SHEET HAS BEEN REPLACED

copolymer, a N-vinyl-2-pyrrolidinone-long chain α-olefin copolymer, a N-vinyl-2-pyrrolidinone-dimethylaminoethyl methacrylate copolymer, a poly (methyl vinyl ether-maleic anyhydride), or a quarternised copolymer of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate.

9. A fluid as defined in any one of claims 1 to 8, wherein the bactericide is iodophor.

10. A fluid as defined in any one of claims 1 to 8, wherein the polymer has N-vinyl-2-pyrrolidinone as a component thereof and wherein the bactericide is formed by complexing iodine therewith.

11. A fluid as defined in any one of claims 1 to 10, contained in an apparatus which comprises a container for said fluid defining a reservoir, an applicator head in fluid communication therewith, fluid flow restricting means between said reservoir and said applicator head, first cap means associated with said container for filling with fluid and second cap means for said applicator head to prevent evaporation of fluid therefrom, wherein said applicator head comprises a resilient porous pad held in a dome shaped cap in content with said fluid flow restricting means.

CLMS

This Sheet Has Been Replaced

REPLACEMENT SHEET
18 SEP 199

THIS SHEET HAS BEEN REPLACED

ABSTRACT

ANTISEPTIC FLUIDS

The invention relates to dual purpose antiseptic fluids, which additionally to being effective skin disinfectants are also capable on drying to form skin protective film with residual antibacterial properties. These antiseptic fluids, while primarily applied as skin disinfectants for pre- and post surgery, dermatological infections, burn treatment as well as first aid for superficial wounds, cuts and abrasions, offer the additional advantage of a temporary or longer lasting skin and wound dressing, depending on the film forming polymer used, without impairing the normal physiological activity of the skin.

The invention also relates to medical surgical, and veterinary devices in particular to liquid applicators for antiseptic fluids to the human skin for medical, pre-and post surgical applications and first-aid.

This Sheet Has Been Replaced

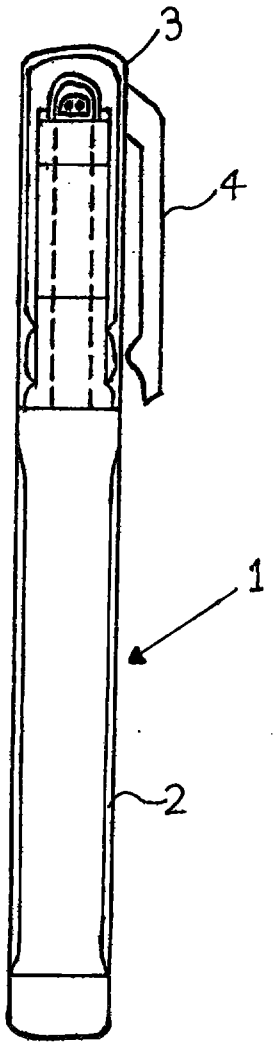


FIG. 1

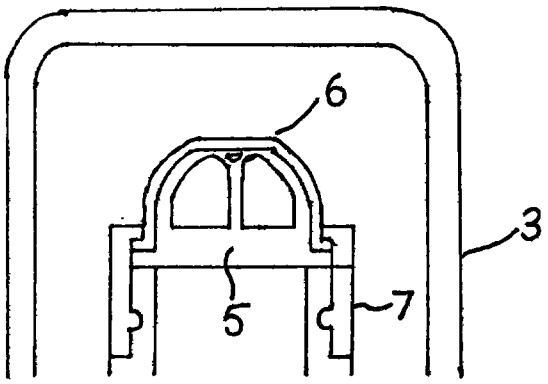


FIG. 2

960502-P

ANTISEPTIC FLUIDS

ABSTRACT

The invention relates to dual purpose antiseptic fluids, which additionally to being effective skin disinfectants are also capable on drying to form skin protective film with residual antibacterial properties. These antiseptic fluids, while primarily applied as skin disinfectants for pre- and post surgery, dermatological infections, burn treatment as well as first aid for superficial wounds, cuts and abrasions, offer the additional advantage of a temporary or longer lasting skin and wound dressing depending on the film forming polymer used, without impairing the normal physiological activity of the skin.

The invention also relates to medical surgical, and veterinary devices in particular to liquid applicators for antiseptic fluids to the human skin for medical, pre- and post surgical applications and first-aid.

Fig. 1

REPLACEMENT SHEET

12 DEC 1996

REPLACEMENT SHEET

and bacteristats, no adverse, or considerably reduced adverse skin reactions such as reddening of the skin or itching occur, although a dressing containing such agents is left in-contact with the skin for many hours.

The present invention thus relates to a dual purpose antiseptic fluid which additionally to being a liquid disinfectant for broken and unbroken skin, open wounds, burns, cuts and abrasions, leaves a protective dressing in form of an elastic film over the treated areas with residual antibacterial properties.

The dual purpose antiseptic fluid of the invention, after disinfection provides an elastic dressing which does not interfere with the normal physiological activity of the skin and is removable with water or with soap and water.

The antiseptic fluid of the invention causes a minimum of irritancy to sensitive skin otherwise caused by the direct contact and deposition of the bactericide and/or bacteristat direct onto the skin.

The invention also relates to a simple, reusable device for the application of the antiseptic fluid in an economic and effective manner to surfaces such as skin.

The invention therefore provides a dual purpose antiseptic fluid comprising: at least one bactericide and/or bacteristat selected from chlorhexidine, chlorhexidine salts, cetyl tetramethylammonium bromide, benzalkonium chloride, triclosan, hexachlorophene, tribromsalan, triclocarban, cloflucarban, an iodophor or a mixture of two or more thereof; at least one water soluble or water dispersible film forming polymer and water in the form of a substantially aqueous solution characterised in that on application to skin surfaces and drying a water soluble film results.

The fluid of the invention may optionally contain a water miscible, non-toxic volatile co-solvent such as a lower alcohol, e.g. ethanol, isopropanol, or the like.

The use of a slow drying solvent in such antiseptic fluids allows sufficient time for the active ingredients to act as in any other antiseptic fluid to assure complete disinfection of the treated skin area. It is generally accepted that for efficient skin disinfection, the composition should be in contact with the skin for about 30 to 90 seconds. For practical purposes however, the drying time of the solvent should be adjusted by the addition of the appropriate quantity of a water miscible volatile co-solvent such as ethanol or isopropanol, so that film forming takes place preferably between about 30 and about 60 seconds. It is

REPLACEMENT SHEETS SG
☑ Description : paged 5 to paged 7
☑ Claim(s) : paged 16 to paged 17
☐ Drawing(s) : paged ..... to paged .....
☐ Abstract : paged ..... to paged .....
DATE OF RECEIPT 11/4/98

9605022-4

The claims defining the invention are as follows:

1. A dual purpose antiseptic fluid comprising: at least one bactericide and/or bacteristat selected from chlorhexidine, chlorhexidine salts, cetyl tetramethylammonium bromide, benzalkonium chloride, triclosan, hexachlorophene, tribromsalan, triclocarban, cloflucarban, an iodophor or a mixture of two or more thereof; at least one water soluble or water dispersible film forming polymer and water in the form of a substantially aqueous solution characterised in that on application to skin surfaces and drying a water soluble film results.

2. A fluid as defined in claim 1, further comprising at least one water miscible, non-toxic, volatile liquid.

3. A fluid as defined in claim 1 or claim 2, further comprising at least one topical local anaesthetic.

4. A fluid as defined in any one of claims 1 to 3, further comprising at least one moisturiser.

5. A fluid as defined in claim 4, wherein the moisturiser is glycerol, sorbitol, diethylene, glycol, polyethylene, glycol, or a nonionic lanoline derivative.

6. A fluid as defined in any one of claims 1 to 5, wherein the polymer is methylcellulose, ethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose, carboxymethylcellulose and its alkali metal salts and partial salts with 2-aminomethylpropanol, diethylaminopropylamine and triisopropanolamine; copolymers of N-vinyl-2-pyrrolidinone with vinyl acetate, vinyl propionate, crotonic acid, long chain α-olefins, alkylaminoacrylates and methacrylates; copolymers of vinyl acetate with crotonic acid; terpolymers of N-vinyl-2-pyrrolidinone with vinyl acetate and vinyl propionate, or with vinyl acetate and alkylaminoacrylates or methacrylates; quarternised copolymers of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate; poly(methyl vinyl ether-maleic anhydride); and polymers having free carbonyl groups.

7. A fluid as defined in claim 6, wherein the polymer is carboxymethylcellulose, a vinyl acetate-crotonic acid copolymer, a vinyl acetate-vinyl propionate-crotonic acid terpolymer, a vinyl acetate-N-vinyl-2-pyrrolidinone copolymer, a N-vinyl-2-pyrrolidinone-long chain α-olefin copolymer, a N-vinyl-2-pyrrolidinone-dimethylaminoethyl

* C L M S *

11 FEB 1988

methacrylate copolymer, a poly(methyl vinyl ether-maleic anhydride), or a quarternised copolymer of N-vinyl-2-pyrrolidinone and dimethylaminoethyl methacrylate.

8. A fluid as defined in any one of claims 1 to 7, wherein the bactericide is an iodophor.

9. A fluid as defined in any one of claims 1 to 8 contained in an apparatus which comprises a container for said fluid, defining a reservoir, an applicator head in fluid communication therewith, fluid flow restricting means between said reservoir and said applicator head, first cap means associated with said container for filling with fluid and second cap means for said applicator head to prevent evaporation of fluid therefrom, wherein said applicator head comprises a resilient porous pad held in dome shaped cap in contact with said fluid flow retricting means.

10. A fluid as defined in claim 9 wherein the iodophor is polyvinylpyrrolidinone.

* C L M S *