(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/053714 A2

(51) International Patent Classification[7]: A61K 33/00

(21) International Application Number:
PCT/GE2004/000006

(22) International Filing Date: 2 December 2004 (02.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
AP 2003 005325 3 December 2003 (03.12.2003) GE
AP 8516 26 November 2004 (26.11.2004) GE

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *without international search report and to be republished upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

WO 2005/053714 A2

(54) Title: PHARMACEUTICAL COMPOSITION, METHODS OF OBTAINING AND USE THEREOF

(57) Abstract: Invention relates to the field of medicine, is used as a disinfecting composition in medicine, veterinary medicine, in biological, pharmaceutical and food industry, for domestic purpose, bathes, public conveniences, beauty saloons, etc. It can be used for treatment purposes as an antiseptic means. Technical result is in creation of innocuous pharmaceutical composition that is simple for production, cheap and has high disinfecting and antiseptic properties. The pharmaceutical composition comprises a weak nitric acid, ammonia synthesis catalyst waste residue that in mixture with the other chemical compounds contains specular iron not less than 50%, citric acid, ethyl alcohol, aromatizer and water in the following ratio of components, mass %: Weak nitric acid 0,3 - 10,0 Ammonia synthesis catalyst waste residue 0,1 - 5,0 Citric acid 0,1 - 2,0 Ethyl alcohol 0,1 - 5,0 Aromatizer 0,05-0,1 Water the rest

# PHARMACEUTICAL COMPOSITION, METHODS OF OBTAINING AND USE THEREOF

Invention proposed in the application relates to the field of medicine and is used as a disinfecting means in medicine, veterinary medicine, in biological, pharmaceutical and food industry, for domestic purposes, etc. It can be used for treatment purposes as an antiseptic means.

As it is known, disinfecting and antiseptic means are used widely in the hospitals and other health institutions for antimicrobial treatment of surfaces. They have particularly wide application in prevention of infection diseases and hospital infections.

Conventionally antimcrobial substances may be divided in three groups: 1) disinfecting means used for destruction of microorganisms in environment; 2) antiseptic means used locally against microbes in wounds, skin and mucous membrane; 3) chemical and therapeutic means used for treatment of infection diseases.

Generally spectrum of disinfecting means action is much wider. They represent chemical agents of such a spectrum that destroy or stop growth of microbes in the live organisms or in some substances or on the surface thereof.

A pharmaceutical means presented in the application has strong disinfecting, as well as substantial antiseptic properties.

There are known many disinfecting means characterized with the above properties (Pharmaceutic and Therapeutic Reference Book, TRINUS F.P., p.453, 477). For example, such are boric and silicum acids and different kinds of disinfecting and antiseptic means made on their base. Mechanism of their antimicrobial action on infected surfaces is conditioned by creation of acid medium. They, in result of intrusion of microbe cell, are exposed to dissociation and cause there (in microbe cell) binding and precipitation of albumen (albuminate). These acids may be characterized as weak disinfectants.

There is also known a disinfecting means (Soviet Author's Certificate N 1172514, A01N37/02) obtained by radiation of ultra-violet rays having certain length of wave in the process of mixing hydrogen peroxide and formic acid.

Deficiency of said method is a technological complexity of radiation operation with ultra-violet rays of mixing components, for which special installations and apparatus are necessary. In addition, ultra-violet irradiation has a negative effect on living organism. At

execution of said method formic acid and hydrogen peroxide are applied that cause burn on the skin of a human and with this reason use of individual means of protection is necessary.

There is also known a widely spread disinfecting means "Lysoformin-3000" (Methodological Instructions of Using "Lysoform 3000", Dr. Hans Rosemann GmbH). It comprises glutaraldehyde, glycosal, didecyldimethylamine chloride and active components added therein, oxidizing inhibitors, stabilizers, colorant and excipients. Technological process of obtaining said disinfecting means is very complex. At the same time, before its application strict safety rules should be observed that protect respiratory tracts, skin and eyes. After application of the solution it is desirable to clean everything with soap water and double cleansing with distilled water. At the same time the disinfecting solution must be stored in the dark, air-convection vault, in the place inaccessible for general use, as it has self-inflammable features. Use of the solution is dangerous in view of poisoning of the maintenance staff.

There is known the disinfecting means "Pharmadez" comprising hydrogen peroxide and potassium fluoride with promoter added therein (Internet: hhttp://www.farmahim.ru, preparation "Farmadez", 20.05.2002). It is remarkable, that action time of said disinfectant for achieving the final target are 60 or 120 minutes that is much more in comparison with the other disinfectants. At the same time, aggressive features of hydrogen peroxide and potassium fluoride should be marked and their compound produces very aggressive and poisonous substance such as fluorine acid causing poisoning and burn. That is why, their safety norms and means must be observed and applied. Special conditions for their storage are also required.

Here should be marked that application of present analogues (Pharmaceutic and Therapeutic Reference Book, TRINUS F.P., p.453, 477; Methodological Instructions of Using "Lysoform 3000", Dr. Hans Rosemann GmbH; Internet: hhttp://www.farmahim.ru, preparation "Farmadez", 20.05.2002).) as antiseptic means is not known to us.

Purpose of the present invention is to create simple for manufacture, cheap innocuous pharmaceutical composition with high disinfecting and antiseptic properties.

Essence of the proposed invention is in that the pharmaceutical composition, comprising a weak inorganic acid, salt of inorganic substance and solvent, as an inorganic acid a weak nitric acid is used, and as an inorganic substance salt an ammonia synthesis catalyst waste residue that in mixture with the other chemical compounds contains specular iron not less than 50% and as a solvent water and ethyl alcohol are used. In addition, citric

acid aromatizer are added in the solution. Said composition is presented in the following ratio of components, mass %:

| | |
|---|---|
| Weak nitric acid | 0,3 – 10,0 |
| Ammonia synthesis catalyst waste residue | 0,1 – 5,0 |
| Citric acid | 0,1 – 2,0 |
| Ethyl alcohol | 0,1 – 5,0 |
| Aromatizer | 0,05-0,1 |
| Water | the rest |

A method for obtaining the pharmaceutical composition is characterized in that for obtaining the composition at first ammonia synthesis catalyst waste residue that in mixture with the other chemical compounds contains specular iron not less than 50% and citric acid are mixed with ethyl alcohol till obtaining a homogeneous mass, and after a weak nitric acid and water are added. After this the solution is heated and settled under pressure till obtaining a transparent fraction. The solution is purified of the precipitant and aromatizer is added. The pharmaceutical composition is obtained in the following ratio of components, mass %:

| | |
|---|---|
| Weak nitric acid | 0,3 – 10,0 |
| Ammonia synthesis catalyst waste residue | 0,1 – 5,0 |
| Citric acid | 0,1 – 2,0 |
| Ethyl alcohol | 0,1 – 5,0 |
| Aromatizer | 0,05-0,1 |
| Water | the rest |

The pharmaceutical composition presented in the invention is used for disinfecting. It is distinguished with high chemical stability.

By means of the presented pharmaceutical disinfecting solution disinfecting of surfaces is performed by the following methods: by dipping up to complete covering, or cleaning with wet rag, or aerosol spraying, or irrigation up to complete wetting. For the purpose a pharmaceutical composition, comprising weak nitric acid, ammonia synthesis catalyst waste residue that in mixture with the other chemical compounds contains specular iron not less than 50%, citric acid, ethyl alcohol, aromatizer and water, are used in the following ratio of components, mass %:

| | |
|---|---|
| Weak nitric acid | 0,3 – 10,0 |
| Ammonia synthesis catalyst waste residue | 0,1 – 5,0 |

| | |
|---|---|
| Citric acid | 0,1 – 2,0 |
| Ethyl alcohol | 0,1 – 5,0 |
| Aromatizer | 0,05-0,1 |
| Water | the rest |

The pharmaceutical composition presented in the application is applied as an antiseptic means for treatment of insignificant trauma of skin.

Proposed pharmaceutical composition is obtained as follows:

Ammonia synthesis catalyst waste residue 0,1÷5,0% of full volume and citric acid 0,1÷2,0% of full volume are taken and mixed with 0,1÷5,0% of full volume of ethyl alcohol, after in the mixture a weak nitric acid 0,3÷10,0% of full volume is added and is filled with water till receiving 100%, all the mentioned is mixed once more, heated 25-90°C and settled under pressure $1{,}013.10^4 \div 1{,}013.10^5$ Pascal till obtaining a transparent fraction and this transparent fraction is poured in another vessel. Further aromatizer is added. Activation and catalyst process, taking place during the preparation process of the solution, enables to receive homogeneous and active mixture. At the same time, the mixture is distinguished with good moisturizing features. It is economical at application.

At obtaining of the proposed pharmaceutical composition, use of less or more amount of the terminal value of the applied components has a negative effect on the quality or use conditions of the obtained disinfecting means.

One of the substances contained in the pharmaceutical composition such as weak nitric acid is given calculated on the concentrated acid. The amount less than 0,3% of the weak nitric acid reduces bactericidal and virusicidal properties, and more than 10,% - has a negative effect on the quality and properties of the mixture.

The amount less than 0,1% of ammonia synthesis catalyst waste residue causes instability and low efficiency of the obtained final product, and the amount more than 5,0% - increases the mass of separated precipitant and practically does not change the quality of the compound for better. It should be marked that waste catalyst has lost the catalyst properties, and in complex with the composition elements displays very effective disinfecting properties. Though, application of the unused catalyst in comparison with the used – displays different (much less effective) disinfecting properties.

Taking of the amount of citric acid less than 0,1% does not cause effective action of the compound, and more than 2,0% causes sharp change of the solution pH.

Taking of the amount of ethyl alcohol less than 0,1% is insufficient for the solvent function, and the amount more than 5,0% increases less the efficiency of the final product due to the access dilution and, at the same time, unnecessary expenses increase.

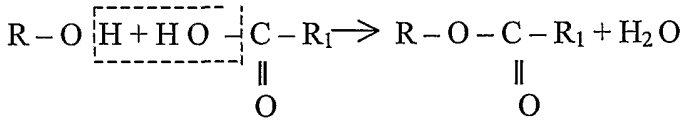
As aromatizers are used such compounds that do not change composition properties and have a nice aroma.

At obtaining of the homogeneous compound the ordinary water is used as a solvent.

To obtain the pharmaceutical composition monatomic spirit – ethyl alcohol was taken, application of the other representatives of this group shall give the similar technical effect, but we refrain from using them as they are poisons. Purpose of the present invention is obtaining of safe universal disinfecting means.

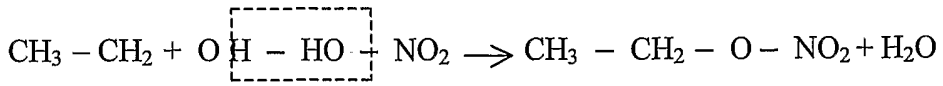
Citric acid, an organic acid used by us, represents a triatomic hydroxy-acid. Application of monatomic and diatomic organic acids is inadmissible as in reaction with the nitric acid give easily ignitable and explosive substances.

In the pharmaceutical composition created according to this method esterification takes place and this at the same time enables to obtain a compound with a very stable effect. Process of esterification is carried out according the schematic model: hydroxyl is taken from the acid, hydrogen – from spirit. Both processes of esterification are invertible.



Ethyl alcohol Citric acid Complex ester Water

Ethyl alcohol is in reaction with the citric acid and in result we receive water and complex ester.



Ethyl alcohol Nitric acid Ethyl nitrate Water

Ethyl alcohol with nitric acid develops water and complex ester.

Complex esters are easily hydrolized. In water they break down into initial components. Due to invertible character of esterification finally chemical equilibrium takes place.

The pharmaceutical composition is obtained in a reactor or in similar technological equipment. The solution placed in the reactor and is heated on 25°C-95°C temperature and settled on this temperature under pressure $1{,}013.10^4 \div 1{,}013.10^5$ Pascal till obtaining a transparent fraction.

Isochoric process takes place in the reactor. During the process in automatic mode is regulated volume, temperature, density, pH and pressure of the solution therein. Their ratio is a constant value.

The reactor is filled with the components of the chemical process up to 70% of its volume. At using the reactor we consume less raw and power.

Concrete examples of the method of obtaining of the pharmaceutical composition.

Example 1. 0,1% of the ammonia synthesis catalyst waste residue and 0,1% of the citric acid are taken, mixed in a vessel with 0,1% of ethyl alcohol, 0,3% of the weak nitric acid is added, filled with 100% water and all the mentioned is mixed, heated 75° and settled under pressure $7{,}0.10^4$ Pascal till obtaining of a transparent fraction. The transparent fraction is poured in a separate vessel. Six hours effect of the obtained substance on the physiological solution saturated with bacteria gives 100% bactericidal and virusicidal effect after 20 minutes.

Example 2. 1,0% of the ammonia synthesis catalyst waste residue and 0,8% of the citric acid are taken, mixed in a vessel with 1,0% of ethyl alcohol, 1,5% of the weak nitric acid is added, filled with 100% water and all the mentioned is mixed, heated 55° and settled under pressure $7{,}0.10^4$ Pascal till obtaining of a transparent fraction. The transparent fraction is poured in a separate vessel. Six hours effect of the obtained substance on the physiological solution saturated with bacteria gives 100% bactericidal effect at 5 minutes exposition, and virusicidal effect - during 20 minutes.

Example 3. 1,5% of the ammonia synthesis catalyst waste residue and 1,5% of the citric acid are taken, mixed in a vessel with 2,5% of ethyl alcohol, 5,0% of the weak nitric acid is added, filled with 100% water and all the mentioned is mixed, heated 45° and settled under pressure $4{,}0.10^4$ Pascal till obtaining of a transparent fraction. The transparent fraction is poured in a separate vessel. Six hours effect of the obtained substance on the physiological

solution saturated with bacteria gives 100% bactericidal effect at 5 minutes exposition, and virusicidal effect - during 10 minutes.

Example 4. 5,0% of the ammonia synthesis catalyst waste residue and 2,0% of the citric acid are taken, mixed in a vessel with 5,0% of ethyl alcohol, 10,0% of the weak nitric acid is added, filled with 100% water and all the mentioned is mixed, heated 35° and settled under pressure $4{,}0.10^4$ Pascal till obtaining of a transparent fraction. The transparent fraction is poured in a separate vessel. Six hours effect of the obtained substance on the physiological solution saturated with bacteria gives 100% bactericidal and virusicidal effect during 5 minutes.

Use of the composition for disinfecting of the surface is possible by several methods. In certain cases by using the aerosol method the technological process of disinfectant application is improved.

Surfaces of the items before their treatment with the disinfecting solution must be cleaned of any mechanical and organic contamination by ordinary conventional methods.

Proposed pharmaceutical composition, which is used as a disinfecting solution, differs from the existing in that it cleans the high-molecular organic substances (fats, proteins, hydrocarbons, etc) from the surfaces easily, binds and hardens the, where in such a case the existing analogues dissolve them contaminating the working solution making analogue disinfecting solutions useless for further disinfecting and use.

In our case the disinfecting solution can be filtered by simple laboratory method that separates the hardened organic substances enabling further use of the solution.

Proposed disinfecting means according to the conditions of action and dilution, causes either bacteriostatic (reduces growth and propagation of microbes), or bactericidal action (kills microbes) on the following kinds of bacteria and viruses (see Tables 1 and 2). Signs in Tables 1 and 2: + means growth of bacteria and viruses; - means that growth was not observed.

Following conditions influence anti-microbe and anti-virus effect of the proposed compostion:

- Concentration of disinfecting solution and degree of its disassociation. Higher the concentration, higher is the effect;

- Duration of the disinfecting solution action. By increasing the action time increases efficiency or visa versa;

- Degree of contamination with the high-molecular organic substances existing on the work surface. At disinfecting the items contaminated with the high-molecular organic substances anti-microbe and anti-virus force reduces or visa versa increases according to the contamination degree and quantity;

- Temperature of the disinfectant. By increasing or reducing the temperature of the disinfecting solution increases or reduces (not much, but still) the force of the disinfecting solution effect;

- Kinds of microbes and viruses. In the case of the same concentration of the disinfecting solution, the solution with equal force (same result) does not have effect on all possible microbes and viruses.

Application of the pharmaceutical composition as a disinfectant is possible in the public spaces (schools, kindergartens, markets, domestic objects, cinemas), as well as for treatment of furniture, sanitary and technical equipment, restaurants and laboratory glassware, linen, medical stock, for cleaning and disinfecting of textile products; for neutralizing of patients' discharge; for combating of hospital infections. With the proposed preparation may be treated any stocks made of rubber, plastic, glass, metal, used in the medical and prophylactic institutions.

The pharmaceutical composition is characterized with the following properties:

- at application of minimal concentration active action is instantly initiated;
- it dries up quickly without traces on the treated surfaces.

Proposed pharmaceutical composition as an anti-microbe substance according to formulation and action mechanism relates to the group of disinfectants having acid properties.

Chemical and biological essence of the pharmaceutical composition may be explained simply.

Acid medium during local effect on the tissues according to the concentration causes binding (in weak dilution), or irritating, necrotic action (high dilution). Described action of the acid medium is based on its action with proteins, when the proteins lose water and condense (albuminate). At applying strong acid mediums the occurring albuminate is stable, that is why tissue injury is superficial (the so-called coagulation necrosis). Said mechanism is conditioned as well by the anti-microbe action of acid mediums, they in result of intrusion in a microbe cell are subject to dissociation, cause there (in the microbe cell) binding and precipitation. In result bacteria are either killed or do not develop and propagate further.

Dilutions of the pharmaceutical composition and their effect are presented in Table 3. Results of the carried out experiments on disinfecting the surfaces are presented in Table 4. Conventional signs should be understood as follows:

--- disinfected

® partially disinfected

+ is not disinfected

Research was performed for the following conditions: Air humidity % 75÷86; Disinfectant solution temperature; Air temperature in the storehouse building no less than 10°C

At the same time, to obtain 1 liter of 0,5% solution 50ml of 10% concentrate is taken, for 1,0% - 100ml and for 2,0% - 200ml, the rest is water. For dilution the ordinary water is used.

In view of pharmacological action, the proposed pharmaceutical disinfecting composition reveals general antiseptic properties.

It, as an antiseptic means, is used for treatment of insignificant traumas of skin, such as scratches, fissures, cuts.

For treatment of said diseases 1-3% solution of the pharmaceutical composition is used. For treatment it is required to wash the injured place with the solution, or a bandage treated with the solution should be laid from above. These procedures are repeated several times, as required.

Example of using the proposed pharmaceutical composition as an antiseptic means.

The pharmaceutical composition was tested by an emergency staff on 50 patients having subcutaneous wounds of various complexity on the body. In all the cases of treatment of the wounds the surface of the wound, as well as the skin around it, was cleaned and washed from contamination with the bandages treated with the 3% solution of the proposed pharmaceutical composition, after bandages treated in the same solution were applied. Such a treatment of the wound in all the cases displayed best results for the purpose of protecting the wounds from primary infections. There were no cases of contra-indication.

Proposed disinfecting pharmaceutical composition, as an antiseptic means is characterized not only by good therapeutic action, but by simplicity of application. Practical application has clearly shown that the proposed composition as an antiseptic is much more strong and active, than boric acid and salicyl acid of the same group.

For obtaining of the pharmaceutical composition in the proposed invention residue catalyst (that in mixture with the other chemical compounds contains specular iron not less than 50%) of a chemical plant is used that is a significant economic precondition for obtaining of the disinfecting means proposed by us. At the same time, the technological process of obtaining the composition is simple, does not require complex apparatus and installations and in result we receive the pharmaceutical composition with unique chemical properties displaying, from the chemical point of view, properties of the disinfectants having different action mechanisms. Composition gives high quality bactericidal and virusicidal effect even at significant contamination of the items' surfaces with high-molecular organic substances.

At dilution of the concentrated composition and further at its application, it is not necessary to use individual means of protection. It is remarkable, that scanty amount of the weak nitric acid, ammonia synthesis catalyst waste residue (that in mixture with the other chemical compounds contains specular iron not less than 50%), citric acid and ethyl alcohol, as well as their compounds, at occurring on the human body do not cause any negative action.

## CLAIMS

1. A pharmaceutical composition comprising weak inorganic acid, inorganic substance salt and solvent characterized in that as an organic acid a weak nitric acid is used, and as an inorganic substance salt an ammonia synthesis catalyst waste residue that in mixture with the other chemical compounds contains specular iron not less than 50% and as a solvent water and ethyl alcohol are used, whereas the solution in addition comprises a citric acid and aromatizer in the following ratio of components, mass %:

| | |
|---|---|
| Weak nitric acid | 0,3 – 10,0 |
| Ammonia synthesis catalyst waste residue | 0,1 – 5,0 |
| Citric acid | 0,1 – 2,0 |
| Ethyl alcohol | 0,1 – 5,0 |
| Aromatizer | 0,05-0,1 |
| Water | the rest |

2. The pharmaceutical composition according to claim 1 characterized in that ammonia synthesis catalyst waste residue comprises oxides of iron, chromium, magnesium, zinc, copper and other elements.

3. The pharmaceutical composition according to claims 1, 2 characterized in that ammonia synthesis catalyst waste residue comprises specular iron not less than 50%.

4. A method of obtaining the pharmaceutical composition according to claims 1, 2, 3 providing for interaction of the weak inorganic acid, inorganic substance salt and solvent characterized in that as an inorganic acid a nitric acid is used, and as a salt an ammonia synthesis catalyst waste residue, as a solvent water and ethyl alcohol are used, citric acid, aromatizer are added therein, whereas at first the ammonia synthesis catalyst waste residue and the citric acid are mixed with the ethyl alcohol till obtaining a homogeneous mass, then the weak nitric acid is added and diluted with water, heated and settled under pressure till obtaining a transparent fraction, after it is purified of precipitant and aromatizer is added, in the following ratio of said components, mass %:

| | |
|---|---|
| Weak nitric acid | 0,3 – 10,0 |
| Ammonia synthesis catalyst waste residue | 0,1 – 5,0 |
| Citric acid | 0,1 – 2,0 |
| Ethyl alcohol | 0,1 – 5,0 |

| | |
|---|---|
| Aromatizer | 0,05-0,1 |
| Water | the rest |

5. The method according to claim 4 characterized in that mixing and interaction of the constituent elements of the pharmaceutical composition is performed in the closed system, for example, reactor or similar technological equipment.

6. The method according to claims 4 and 5 characterized in that the process in the reactor is performed on the temperature 25-90°C and under pressure $1{,}013.10^4 \div 1{,}013.10^5$ Pascal.

7. The pharmaceutical composition according to claims 1, 2, 3 is obtained by the method of claims 4, 5, 6.

8. Use of the pharmaceutical composition of claims 1, 2, 3 as a disinfectant.

9. Method of use of the pharmaceutical composition providing for treatment of the surfaces with the disinfectant characterized in that treatment is performed with the pharmaceutical composition of claims 1, 2, 3.

10. Method of use of the pharmaceutical composition providing for treatment of the surfaces with the disinfectant characterized in that treatment is performed with the pharmaceutical composition obtained by the method of claims 4, 5, 6.

11. Method of use of the pharmaceutical composition providing for treatment of the surfaces with the disinfectant characterized in that treatment is performed with the pharmaceutical composition of claims 1, 2, 3 obtained by the method of claims 4, 5, 6.

12. The method according claims 9, 10, 11 characterized in that polluted surfaces are treated by dipping up to complete covering, or cleaning with wet rag, or aerosol spraying, or irrigation up to complete wetting.

13. Use of the pharmaceutical composition of claims 1, 2, 3 as antiseptic means.

14. Use according claim 13 performed by cleaning of the surface with a wet rag or aerosol spraying, or by applying wet bandage.

**Table 1.**

**Results of testing of bactericidal action**

| Name of bacterium | Exposition min | Concentration of disinfecting solution , % | | | | | | Control |
|---|---|---|---|---|---|---|---|---|
| | | 0,05 | 0,1 | 0,2 | 0,5 | 1 | 2 | |
| Jersinia Pertis | 3 | - | - | - | - | - | - | + |
| | 5 | - | - | - | - | - | - | + |
| Jersinia enterocolitica | 3 | + | + | + | - | - | - | + |
| | 5 | + | + | - | - | - | - | + |
| Salm.typhimurium | 3 | + | + | + | - | - | - | + |
| | 5 | + | + | - | - | - | - | + |
| Klebsiela aerobacter | 3 | + | + | + | - | - | - | + |
| | 5 | + | + | - | - | - | - | + |
| Vibrio cholerac | 3 | + | - | - | - | - | - | + |
| | 5 | - | - | - | - | - | - | + |
| Shigella disentericue | 3 | + | - | - | - | - | - | + |
| | 5 | - | - | - | - | - | - | + |
| Escherichia coli | 3 | + | + | + | + | - | - | + |
| | 5 | + | + | + | - | - | - | + |
| Staphilococcus aurus | 3 | + | + | + | + | - | - | + |
| | 5 | + | + | + | + | - | - | + |

**Table 2.**

**Results of testing virusicidal action**

| Name of virus | Exposition min | Concentration of disinfecting solution, % | | | | | | Control |
|---|---|---|---|---|---|---|---|---|
| | | 0,05 | 0,1 | 0,2 | 0,5 | 1 | 2 | |
| The so-called West-Nilus Fever | 3 | - | - | - | - | - | - | + |
| | 5 | - | - | - | - | - | - | + |
| Influenza virus A-1 | 3 | + | - | - | - | - | - | + |
| | 5 | - | - | - | - | - | - | + |
| Coxsackie virus B-1 | 3 | + | + | - | - | - | - | + |
| | 5 | + | + | - | - | - | - | + |
| Hepatitis virus A-1 | 3 | + | + | + | + | - | - | + |
| | 5 | + | + | + | + | - | - | + |

**Table 3.**

**Field and time of application taking into account concentrations**

| Concentration, % / Name of appointment | 0,5% | 1,0% | 1,5% | 2,0% |
|---|---|---|---|---|
| Disinfecting of bacteria and viruses | | 30 minutes | | 20 minutes |
| Staphylococcus aurus and hepatitis B | | | 1 hour | 30 minutes |
| Hospital infection | | | | 1 hour |
| Treatment of tools and surfaces | | | | 30 minutes |
| Treatment of tissues | 1 hour | | | |
| Treatment of hands | | 3 minutes | | |

**Table 4.**

**Results of the carried out experiments on disinfecting the surfaces**

| **Type of bacteria** | **Concentr. of the solution %** | **Solution expendi-ture l/m²** | **Turn of the solution appliance on the surface** | **l/m²** | **Experi-ments amount** | **Disin-fecting results** | **Exposi-tion hours** |
|---|---|---|---|---|---|---|---|
| **Staphylococcus aurus** | 0,25 | 0,5 | 2 | (0,250) | 3 | + | 3 |
| | 0,5 | 0,5 | 1 | (0,5) | 3 | ® | 3 |
| | 0,5 | 0,4 | 2 | (0,2) | 3 | --- | 2 |
| | 1,0 | 0,2 | 1 | (0,2) | 3 | + | 3 |
| | 1,0 | 0,3 | 2 | (0,15) | 3 | --- | 3 |