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(54) Title: A FORMULATION IN THE FORM OF A SUSPENSION FOR THE TREATMENT OF BLOOD-SUCKING PARASITE

(57) Abstract: A formulation containing a suspension solution of substances with disinfecting effect or compounds thereof in water, alcohols and other volatile solvents or mixtures thereof, with the content of acrylate copolymer and/or nitrocellulose for incapacitating and rapid killing and disinfecting of a blood-sucking firmly stuck parasite, which is preferably a tick or a leech, and its easy removal from the place of sticking of the host, which contains up to 25 % by weight of the powder form of a solid inert substance and/or a mixture of solid inert substances based on the weight of all the components of the suspension solution, with the specific area of at least 1 m^2/g.

A formulation containing a suspension solution of substances with the disinfection effect for incapacitating, dehydrating, rapid killing, disinfection and easy removal of a blood-sucking and firmly stuck parasite

Technical Field

The invention relates to a formulation which contains a suspension solution of substances or their compounds in water, alcohols and other volatile solvents or their mixtures, with the content of acrylate copolymer and/or nitrocellulose for incapacitating, dehydrating, rapid killing and disinfection of a blood-sucking and firmly stuck parasite, i.e. in particular a tick or a leech, and its easy and safe removal from the place of sticking of a host.
At the same time, the said formulation can be used for efficient disinfecting of the given parasite itself.

Background Art

Formulations or methods used for removing a blood-sucking and firmly stuck parasite, in particular a tick or a leech, are usually amateur ones (e.g. by shaking out, tearing off etc.), or lengthy and with locally limited usability (e.g. a plaster with a disinfection formulation which is hard-to-be-applied in body folders, hair etc., which are commonly the most frequently occurring places of sticking for a tick).

With regard to the environment it lives in, the leech most frequently sticks on legs and in folders of legs however it can quickly move to other parts of the body as well.

This "amateur" method may result in residues of the removed parasite remaining in the place of sticking, which may consequently result in the importation of infection into the host's body.

One of the other known methods for removing a stuck tick is its removal by means of a special card with slots without prior application of any formulations on the place of sticking. The attached special card firmly catches hold of the tick and pulls it out without squeezing the tick and pushing out the content of its intestines into the wound. Despite user instructions

being attached to the card, it is problematic whether the removing person is skilful enough to remove it without problems, in particular at parts of the body which are difficult to reach.

Another common method is applying an oil or any fat on the place with the tick, when the greased tick is stifled and consequently removed. There is a high risk in this method that the content of tick's intestines can be thrown out directly to the host's wound before its death.

It is known another spread method which consists in killing a tick using a solution of iodine and/or its compounds, where the solution is once or repeatedly dropped onto the tick, or the neck of the opened bottle with a disinfection solution is pressed on the place with a stuck tick.

Another solution for removing a tick, as described in CZ 20342 U1 registered utility model of the state of the art, is using alcohol, water-alcohol and other solutions of iodine and/or its compounds with the addition of suitable substances which are able to polymerize. By applying a disinfection solution modified in this way, a many times higher quantity of an active disinfection substance is applied on the tick as well as on the affected place, and at the same time the formed film of polymerizing substances significantly slows down the evaporation of the solvent and prolongs the contact time of the disinfection substance (still present in the liquid state) with the tick and the skin, which results in prolonging the disinfecting effect. The advantage of this method is an easier application on any place of the skin. A disadvantage of this application is the fact that after evaporation of volatile substances and completed polymerization, the lodged tick and the surrounding area, where the formulation was applied, remain covered with a dried residue of the formulation which is firmly stuck on the skin and causes problems when removed from the skin.

There is a lack of available public publications relating to formulations or methods for removing an undesirable firmly lodged leech also due to the fact that the public usually consider leeches to be a kind of a "medical formulation". However, a firmly lodged undesired leech on the skin combined with variedly contaminated water it lives in can at least pose high health risks.

Summary of the Invention

The subject-matter of the invention is a formulation containing a suspension solution of substances with disinfecting effect or their compounds in water, alcohols and other volatile solvents or mixtures thereof, with the content of acrylate copolymer and/or nitrocellulose for incapacitating, dehydrating, rapid killing and disinfection of a blood-sucking firmly stuck parasite and its easy removal from the place of sticking of the host, which contains up to 25 % by weight of the powder form of a solid inert substance and/or a mixture of solid inert substances based on the weight of all ingredients of the suspension solution, with the specific area of at least 1 m^2/g.

A firmly stuck parasite is preferably a tick or a leech.

Compared to the closest prior art represented by the CZ 20342 U1 registered utility model, this is an detectable improvement of properties of the formulation according to this invention, where the formulation is a solution of substances with disinfecting effect and moreover, the composition of this formulation contains a powder form of solid inert substances (fillers) and/or mixtures of these solid inert substances, which can be contained up to 25 % by weight based on the weight of all the ingredients of the suspension solution, where their specific area is at least 1 m^2/g.

The result is that in addition to the above mentioned properties, such as incapacitating, rapid killing and disinfecting a tick and its easy consequent removal, the formulation according to the present invention has also strong dehydrating effects which results in all the liquids contained in the tick being absorbed in the applied formulation, which is another cause avoiding the entry of tick's body liquids into the wound.

After applying the formulation with the composition according to this invention on the place of the host with a firmly stuck tick or leech, they are incapacitated (immediate anaesthesia) and at the same time the surface of the given parasite, the place and its surrounding are also immediately disinfected.

As it is known from the state of the art represented by CZ 20342 utility model, a many times higher quantity of the active disinfecting substance reaches the affected place with the formulation according to this invention and the formed film of polymerizing substances

decreases the evaporation of volatile ingredients such as solvents, which results in the prolongation of the disinfecting effect and at the same time in the rapid killing of the tick. Moreover, the addition of inert substance(s) in the formulation is important because after the evaporation of volatile ingredients, the completed polymerization and especially tick's dehydration, a residue of the formulation remains on the lodged tick and the surrounding area, which is crumbled away without problems, and the dried formulation does not firmly attach to the skin. The aforementioned addition of an inert substance has not effect on the other properties of the formulation. This new property is highly welcome and gentle to the human skin. It is invaluable in case the formulation is used for animals when the long-term and difficult-to-remove clogging of hair at the place of application does not occur, but this new type of formulation crumbles away.

Similar applies to a leech, where the formulation according to the invention is applied on the entire parasite, or if it is of a larger size, on the part of the parasite it is lodged into (stuck, bit into) the skin in sufficient amount so that the entire parasite or this part is completely covered. After a short period of time the leech is incapacitated and killed and it either falls away itself, or it can be mechanically removed.

The killed, dehydrated and disinfected tick or leech can be easily removed using a pair of tweezers or other suitable manner.

The advantage of the formulation according to this invention is also its easy application.

The suitable design of this invention is the formulation which contains up to 25 w% of the powder form of a solid inert substance, related to the weight of all the ingredients of the suspension solution and/or the mixture of solid inert substances with a high specific area (i.e. a low weight in volume), of at least 100 m^2/g.

With this specific example of inert substances with a higher specific area, the residue of the formulation on the affected place is more easily crumbled away together with the killed tick.

Suitable inert substances according to this invention are powder forms of inert substances, i.e. fine powders of inorganic oxides such as SiO_2-aerosil, Al_2O_3, or inorganic pigments such as TiO_2, or SiO_2 obtained in the chemical way (usually by pyrohydrolysis from volatile chlorides), a fine ground or precipitated calcium carbonate, magnesium carbonate, calcium-magnesium carbonate - dolomite, dialuminosilicates, magnesium dialumosilicates such as magnesium aluminate metasilicate, chalk, talk, calcium phosphate, calcium silicate, bergmeal, mineral powder, quartz powder, porcelain clay, apatite, bentonite, perlite, vermiculite or their mixtures.

Particularly suitable inert substances are SiO_2-aerosil, bentonite or powdered TiO_2.

According to the invention, suitable disinfection substances are, in the reasonable quantity, iodine and its compounds (i.e. with potassium iodide or sodium iodide, iodine-povidon, iodine-phenol), and

aldehydes (formaldehyde, glutaraldehyde, ortho-phthalaldehyde),
quaternary ammonium salts (benzododecinium salts, carbetopendecinium salts, cetrimide),
chlorhexidine digluconate,
phenol,
2-phenylphenol,
cresols,
thymol (isopropyl-m-cresol),
resorcinol,
triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether),
cloroxinum (5,7-dichloro-8-chinolinol),
boric acid, salicylic acid, peroxo-acetic acid, peroxo-formic acid, potassium hydrogen peroxo sulphate,
chloramines etc.

According to this invention, ethanol can be used as a solvent, and diethyl ether contained according to the background art according to the CZ 20342 U1 utility model can be partly or fully replaced with similar, less volatile substances, e.g. propanol or isopropanol and methyl tertiary butyl ether.

They form, together with nitrocellulose or other polymerizing or gel-forming substances, inert substances - fillers and substances with disinfecting properties, the formulation having a

longer period of evaporation after application, but a higher stability during the repeated use and storage.

As stated in the background art represented with the CZ 20342 U1 utility model, the used solution of nitrocellulose in diethyl ether can be replaced according to this technical solution with a suspension water-alcohol gel with similar effect on incapacitating, dehydrating, disinfection and killing a tick.

The following examples of embodiment are intended for interpreting the essence of this invention and cannot be considered limiting for the content of the protection of this invention which is defined in compliance with the patent claims attached.

Examples of embddiment

Example 1

A suspension solution containing 3.25 g of iodine and 1.25 g of potassium iodide dissolved in 100 g of the solution having the same volumes of ethanol and diethyl ether with the content of 4 g of nitrocellulose and 10 g of anhydrous colloid silicon dioxide (Aerosil).

Example 2

A suspension solution containing 3 g of iodine dissolved in 100 g of the mixture having the same volumes of ether with the content of 5 g of acrylate copolymer and 5 g of fine ground bentonite.

Example 3

A suspension solution containing 0.5 g of iodine dissolved in 100 g of the solution having the same volumes of ethanol and diethyl ether with the content of 4 g of nitrocellulose and 10 g of anhydrous colloid silicon dioxide (Aerosil).

Example 4

A suspension solution containing 0.5 g of glutaraldehyde dissolved in 100 g of the solution having the same volumes of ethanol and diethyl ether with the content of 4 g of nitrocellulose and 10 g of anhydrous colloid silicon dioxide (Aerosil).

Example 5

A suspension solution containing 38 w% of ethyl acetate, 27 w% of acrylate copolymer, 9.5 w% of ethanol and 0.5 w% of iodine, containing 25 w% of powdered TiO_2

Example 6

A suspension solution containing 20 w% of ethyl acetate, 15 w% of acrylate copolymer, 17.5 w% of ethanol, 17.5 w% of diethylene ether, 4 w% of nitrocellulose and 1 w% of iodine, containing 25 w% of powdered TiO_2

Example 7

A suspension solution containing 37 w% of diethyl ether, 37 w% of ethanol, 5 w% of nitrocellulose and 1 w% of iodine, containing 20 w% of finely ground calcium phosphate

Example 8

A suspension solution containing 34.5 w% of diethyl ether, 39.5 w% of ethanol, 5 w% of nitrocellulose and 1 w% of iodine, containing 20 w% of chemically precipitated SiO_2 – Aerosil

Example 9

A suspension solution containing 37.5 w% of diethyl ether, 36.5 w% of ethanol, 5 w% of nitrocellulose and 1 w% of phenol, containing 20 w% of chemically precipitated $CaCO_3$

Example 10

A suspension solution containing 34.5 w% of diethyl ether, 39.5 w% of ethanol, 5 w% of nitrocellulose and 1 w% of cresol, containing 20 w% of nano-TiO_2

Example 11

A suspension solution containing 25 w% of diethyl ether, 25 w% of ethanol, 25 w% of methyl tertiary butyl ether, 5 w% of nitrocellulose and 10 w% of salicylic acid, containing 10 w% of chemically precipitated $CaCO_3$

After applying the aforementioned suspension solutions on a firmly stuck parasite, i.e. a tick or a leech (several drops), the tick or the leech were very quickly incapacitated, dehydrated and consequently killed in all of these cases, the tick or the leech as well as the wound were disinfected and the residue of the formulation was easily crumbled away and the tick or the leech easily removed.

The residue was particularly easily crumbed away with the use of the suspension solution with the content of inert substances with a high specific area (above 700 m^2/g), i.e. with powdered TiO_2 and bentonite used in examples 2, 5, 6 and 10. Similar properties were also detected in the used suspension solution with the content of anhydrous colloid silicon oxide (Aerosil) with the specific area of 200 m^2/g, used in examples 3 and 4.

Industrial Applicability

The formulation is intended for the rapid incapacitation, killing and dehydration of a tick and concurrent efficient disinfection of the tick itself.

Patent Claims

1. A suspension solution of substances with disinfecting effect or their compounds in water, alcohols and other volatile solvents or their mixtures, with the content of acrylate copolymer and/or nitrocellulose for incapacitating and rapid killing and disinfecting of a blood-sucking firmly stuck parasite and its easy removal from the place of sticking; **characterised by the fact that** it contains up to 25 w% of the powder form of a solid inert substance and/or a mixture of solid inert substances related to the weight of all the ingredients of the suspension solution, with the minimum specific area of 1 m^2/g.

2. The suspension solution according to claim 1, **characterised by the fact that** the firmly stuck parasite is a tick or a leech.

3. The suspension solution according to claim 1, **characterised by the fact that** it contains:

   up to 25 w% of the powder form of a solid inert substance related to the weight of all the ingredients of the suspension solution and/or a mixture of solid inert substances, with the minimum specific area of 100 m^2/g.

4. The suspension solution according to claims 1 or 3, **characterised by the fact that** inert substances are selected from the group including powder forms of inorganic oxides, such as SiO_2-aerosil, Al_2O_3, or inorganic pigments, such as TiO_2 or SiO_2, obtained in the chemical way, a finely ground or precipitated calcium carbonate, magnesium carbonate, calcium-magnesium carbonate - dolomite, chalk, talk, calcium phosphate, calcium silicate, dialuminosilicates, magnesium dialumosilicates such as magnesium aluminate metasilicate, bergmeal, mineral powder, quartz powder, porcelain clay, apatite, bentonite, perlite, vermiculite or their mixtures.

5. The suspension solution according to claim 4, **characterised by the fact that** inert substances are SiO_2-Aerosil, a powdered form of TiO_2 or bentonite.

6. The suspension solution according to claim 1, **characterised by the fact that** substances with disinfecting effect are selected from the group including iodine, iodine in the mixture with potassium or sodium iodide, iodine povidon, iodine-phenol, formaldehyde, glutaraldehyde, ortho-phthalaldehyde, quarternary ammonium salts, benzododecinium salts, carbetopendecinium salts, cetrimide or chlorhexidine digluconate, phenol, 2-phenyl-phenol, cresols, thymol (isopropyl-m-cresol), resorcinol, triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether), cloroxinum (5,7-dichloro-8-chinolinol), boric acid, salicylic acid, peroxo-acetic acid, peroxo-formic acid, potassium hydrogen peroxo sulphate, chloramines or their mixtures.

7. The suspension solution according to claim 1, **characterised by the fact that** alcohols are selected from the group including ethanol, propanol, isopropanol, butanol or their mixtures.

8. The suspension solution according to claim 1, **characterised by the fact that** the volatile solvents are selected from the group including ethyl acetate, diethyl ether, methyl tertiary butyl ether or their mixtures.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N25/04 A01N59/12 A01N35/02 A01N31/08 A01N59/02
A01N59/04 A01P7/02
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CZ 20 342 U1 (VAKOS XT A S [CZ]) 16 December 2009 (2009-12-16) the whole document	3,6-8
A	EP 1 769 824 A1 (NOF CORP [JP]) 4 April 2007 (2007-04-04) paragraphs [0001], [0002], [0011], [0012], [0017], [0025], [0032], [0040], [0041]	1-8
A	JP 2013 253021 A (IKEJIRI PHARMACEUTICAL CO LTD) 19 December 2013 (2013-12-19) paragraphs [0001], [0004], [0012] - [0015], [0025] - [0027]	1-8

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2015/000033

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X	CN 102 450 253 A (NORTH CHINA PHARMACEUTICAL GROUP AINO CO LTD) 16 May 2012 (2012-05-16)	1,2,4,5
Y	the whole document	3,6-8

A	WO 03/003998 A1 (STOCKHAUSEN CHEM FAB GMBH [DE]; VEEGER MARCEL [DE]; KLOTZ ANDREAS [DE]) 16 January 2003 (2003-01-16) page 1, line 3 - line 15 page 3, line 11 - page 4, line 5 page 5, line 26 - page 6, line 22 page 11, line 6 - page 12, line 10	1-8

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CZ2015/000033

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