

Virus inactivated properties of DEO-SEP against Vaccinia virus in a quantitative suspension test

Determinarea proprietăților inactivant ale produsului DEO-SEPT contra virusului Vaccinia prin metoda suspensiei cantitative

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Abstract

Antiseptics and disinfectants are used extensively in hospital and other health care settings for a variety of topical and hard-surface applications. In particular, they are an essential part of infection control practices and aid in the prevention of nosocomial infection. The virucidal effect of the DEO-SEPT product was demonstrated on the vaccinia virus strain Elstree (Essen University Origin) which has been passaged 10 times in GMK-AH1 (green monkey kidney cell line), three times in HeLa cells and five times in Vero cells (monkey kidney cell line). Evaluation of the effectiveness was done in a quantitative suspension test according with DVV (German Association of the Control of Virus Disease) and RKI (Robert Koch Institute) guideline at the 0.5%, 1% and 2% concentration. The contact time was 5, 15, 30 and 60 minutes into the presence of the control product based on formaldehyde. The results showed the 99.9% inactivation of the initial virus titer (means $>4\log_{10}$ of the initial titer) at 2% after 5 minutes.

Key words: decontamination, Vaccinia, quantitative suspension, test, DEO-SEPT

Rezumat

Antisepticele și desinfectantele sunt utilizate pe scară mare în spitale și în alte unități de sănătate publică pentru dezinfectia suprafețelor având un rol esențial în controlul infecțiilor intraspitalicești. Efectul virucid al produsului DEO-SEPT a fost demonstrat față de virusul vaccinia tulpina Elstree cultivat înainte de inactivare prin 10 subculturi succesive pe linie celulară GMK AH1 (celule renale de maimuță verde), 3 subculturi pe linia HeLa și 5 subculturi pe linia celulară VERO. Metoda de evaluare a eficacității a fost metoda suspensiei cantitative produsul de testat fiind utilizat în diluții 0,5%, 1% și 2%, metodă conformă cu ghidurile DVV (German Association of the Control of Virus Disease) și RKI (Robert Koch Institute). Timpul de contact a fost de 5, 15, 30 și 60 de minute comparativ cu al unui produs martor ce conține ca substanță activă formaldehidă. Rezultatele obținute au demonstrat o inactivare de 99,9% (reducere $> 4,25 \log_{10}$ a titrului viral inițial) după 5 minute la concentrația de 2%.

Cuvinte cheie: decontaminare, Vaccinia, suspensia cantitativă, test, DEO-SEPT

Introduction

Antiseptics and disinfectants are used extensively in hospitals and other health care settings for a variety of topical and hard-surface applications. In particular, they are an essential part of infection control practices and aid in the prevention of nosocomial infections.

To be used in hospital infection controls the disinfectants have to prove the effectiveness against bacteria, fungus as well as viruses strains special selected for this activity.

In the present paper work the commercial disinfectant based on the QAC didecyl-dimethylammonium chloride fatty alcohol ethoxylates C12-C15 was tested for the antiviral activity against vaccinia virus which can suggest the activity against HBV, HIV and against members of orthomyxoviridae families (animal and human as well) H5N1 and H1N1 according with DVV and RKI guidelines.

Materials and Methods

Samples for testing

Deo-Sept the disinfectant based on QAC didecyl-dimethylammonium chloride fatty alcohol ethoxylates C12-C15 active substance, clear, colorless liquid, product specific odor, pH 7.03 manufactured by SC Pasteur Filipești Romania

Culture medium and reagents

- Eagle's Minimum Essential Medium with Earle's BSS (EMEM, Lonza Group Ltd., catalogue no. BE12-125F)
- Fetal calf serum (Biochrom AG, art.no. S 0115)
- 1.4 % Formaldehyde solution (Chemisch-technologisches Laboratorium Dr. Melzer, D-Bremen)
- Aqua bidest. (Fresenius Kabi Deutschland, art. no. P2N 1636071)
- PBS (Invitrogen, art. no. 18912-014)

Virus and cells

Vaccinia virus strain Elstree originated from the Institute of Medical Virology and Immunology of the University of Essen, D-45122 Essen. Before inactivation assays, virus had been passaged 10 times in *GMK AH-1 cells*

(green monkey kidney cell line), three times in *HeLa cells* and five times in *Vero cells* (monkey kidney cell line). The cells were inspected regularly for morphological alterations and for contamination by mycoplasmas. No morphological alterations of cells and no contamination by mycoplasmas could be detected.

Apparatus, glassware and small items of equipment use for the experiment are specific for this purpose.

Experimental conditions

The experiment was performed as following: temperature $20^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$; test product concentration was of 2.0%, 1.0% and 0.5% solutions. The dilution of the product was done in water of standardized hardness with fetal calf serum (FCS) as interfering substance. The testing was performed with vaccinia virus strain Elstree on the 5, 15, 30 and 60 minutes contact time. The positive control was used formaldehyde (0.7%)

Methodology

Test virus suspension preparation

For preparation of test virus suspension, *Vero cells* (ATCC CC81; permanent monkey kidney cells) were cultivated with Eagle's Minimum Essential Medium and 10% or 2% fetal calf serum.

Vero cells were infected with a multiplicity of infection of 0.1. After cells showed a cytopathic effect, they were subjected to a twofold freeze/thaw procedure followed by a low speed centrifugation (10 min and $1000 \times g$) in order to sediment cell debris. After aliquotation, test virus suspension was stored at -80°C .

Preparation of disinfectant dilutions

The disinfectant was diluted before the inactivation experiments with water of standardized hardness to 0.5%, 1.0% and 2.0% solutions. These concentrations were multiplied by a factor of 1.25 due to the addition of virus suspension and interfering substance.

Inactivation assays and controls

Tests were carried out in accordance with the DVV and RKI guideline (1).

Eight parts by volume of the disinfectant were mixed with one part by volume of test virus suspension and one part by volume of Aqua bidestillata. In tests with interfering substance, instead of Aqua

bidest., one part by volume of fetal calf serum was added. Immediately at the end of the chosen exposure time, activity of the disinfectant was stopped by serial dilutions.

Due to a more convenient handling and due to a limited amount of test virus suspension, the volumes in the inactivation assay were 0.1 ml test virus suspension, 0.1ml interfering substance and 0.8 ml test product.

Virus controls were incorporated after the longest exposure time. One part by volume of test virus suspension was mixed with nine parts by volume of Aqua bidest., or with one part by volume of FCS and eight parts by volume of Aqua bidest. A control was carried out with one part by volume of test virus suspension, four parts by volume of PBS (0.1 M, pH value 7.0) and five parts by volume of 1.4% formaldehyde solution. 5, 15, 30 and 60 minutes were chosen as contact times.

For determination of cytotoxicity of the disinfectant, two parts by volume of Aqua bidest were mixed with eight parts by volume of the disinfectant, diluted with ice-cold EMEM and inoculated onto permissive cells.

Values are given as $\log_{10}\text{CD}_{50}/\text{ml}$ (in analogy to $\log_{10}\text{TCID}_{50}/\text{ml}$).

For the control of cell sensitivity two parts by volume Aqua bidest. or one part by volume of FCS and one part by volume Aqua bidest were mixed with eight parts by volume of the lowest apparently non-citotoxic dilution of the product or PBS. This mixture was added to the permissive cell culture. After 1 h at 37°C the mixture was discharged and a comparative titration of the test virus suspension was performed on the pretreated and non pretreated (PBS) cells as described above. Inactivation tests were carried out in sealed test tubes in a water bath at $20^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$. Aliquots were retained after appropriate exposure times, and the residual infectivity was determined. The inactivation experiments were run in two independent assays (two different days). A control of efficiency for suppression of disinfectant activity was not included since at the end of the exposure time dilutions were done immediately. Furthermore, a cell control was incorporated.

Determination of infectivity

Infectivity was determined by means of end point dilution titration in a micro-procedure. For this, samples were diluted with ice-cold EMEM with 2% FCS and 100 μl of each dilution were placed in 8 wells of a sterile polystyrene flat bottomed microtitre plate. 100 μl of fresh trypsinized *Vero cells* were added. Suspension

was adjusted to reach approximately $10 \cdot 10^3$ cells per well. Incubation was at 37°C in a CO_2 -atmosphere (5.0% CO_2 - content). Finally, cultures were observed for cytopathic effects for ten days of inoculation. The infective dose (TCID₅₀) (with 95% level of confidence) was calculated according to the method of Spearman (2) and Kärber (3) with the following formula:

$$\log_{10}\text{TCID}_{50} = X_0 + 0.5 - r/n$$

Meaning:

X_0 = log₁₀ of the lowest dilution with 100% positive reaction

r = number of positive determinations of lowest dilution step with 100 % positive and all higher positive dilution steps

n = number of determinations for each dilution step.

Calculation and verification of virucidal activity

The virucidal activity of the test disinfectant was evaluated by calculating the decrease in titre in comparison with the

control titration without disinfectant (virus control). The difference is given as reduction factor (RF). According to the guideline (Leitlinie) of DVV/RKI, a disinfectant or a disinfectant solution at a particular concentration is having virus-inactivating efficacy if within the recommended exposure period the titre is reduced at least by four log₁₀ steps.

Results and discussions

Determination of cytotoxicity

In parallel with the inactivation tests, the cytotoxicity of DEO-SEPT (2.0%, 1.0% and 0.5%) and 0.7% formaldehyde was measured.

The formaldehyde solution was toxic for the Vero cells in the 1:100 dilutions. This corresponded to a log₁₀CD50/ml of 3.50. Examinations also showed that the veterinary surface disinfectant DEO-SEPT achieved a log₁₀ CD50/ml of 3.50 (2.0%, 1.0% and 0.5%) with all interfering substance (Table 1).

Table 1

Cytotoxicity of DEO-SEPT and 0.7% formaldehyde

Category	Conc.	Interfering substance	Dilutions				
			10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁴
Product	2.0%	Aqua bidest	t	t	-	-	-
Product	2.0%	10.0% FCS	t	t	-	-	-
Product	1.0%	Aqua bidest	t	t	-	-	-
Product	1.0%	10.0% FCS	t	t	-	-	-
Product	1.0%	Aqua bidest	t	t	-	-	-
Product	1.0%	10.0% FCS	t	t	-	-	-
formaldehyde	0.7%	PBS	t	t	-	-	-

t = cytotoxic n.d. = not done

These tests to measure cytotoxicity are imperative, because in this manner the lower detection threshold for non-inactivated vaccinia virus could be determined.

Virus-inactivating properties of formaldehyde control

Formaldehyde (0.7%) reduced the vaccinia virus titre after five minutes by 0.63 ± 0.49 log₁₀ steps.

After 15 and 30 minutes reduction factors of 0.88 ± 0.53 and 1.88 ± 0.53 were measured. After 60 minutes the reduction of virus titre reached 3.88 ± 0.53 log₁₀ steps (Table 2).

Virus-inactivating properties of disinfectant

Results of inactivation assays are demonstrated in tables 2 to 7.

The veterinary surface disinfectant DEO-SEPT was examined as 2.0 %, 1.0 %

and 0.5 % solutions. 5, 15, 30 and 60 minutes were chosen as exposure times.

DEO-SEPT as 2.0% solution was active against vaccinia virus after five minutes of exposure with FCS as interfering substance. The reduction factors were $\geq 4.25 \pm 0.33$ and $\geq 4.13 \pm 0.43$ (Tables 2 and 3). This corresponded to an inactivation of $\geq 99.99\%$, demonstrating an activity against the vaccinia virus.

Tested as 1.0 % solution, DEO-SEPT was active after 5 minutes in the assays without soil load. The reduction factors were $\geq 4.38 \pm 0.37$ and $\geq 4.25 \pm 0.33$.

With FCS as soil load, the 1.0 % solution showed no sufficient activity within 15 minutes (RF: $\geq 3.38 \pm 0.49$) (Tables 4 and 5). The 0.5% solution of DEO-SEPT was also active after 5 minutes in the assays without soil load (RFs: $\geq 4.00 \pm 0.52$ and $\geq 4.00 \pm 0.48$).

With FCS as soil load, the 0.5% solution showed no sufficient activity within 15 minutes (RF: $\geq 1.50 \pm 0.55$) (Tables 6 and 7).

Table 2

1st assay: Inactivation of vaccinia virus by DEO-SEPT (2.0%) and formaldehyde (0.7%) in a quantitative suspension test at 20°C

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	2.0%	Aqua bid	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
test product	2.0%	10.0% FCS	≤3.50±0.00	≤3.50±0.00	≤3.50±0.00	≤3.50±0.00	≥4.25±0.33	≥4.25±0.33	≥4.25±0.33	≥4.25±0.33	5 min
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	7.75±0.33	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.

n.d. = not done n. a. = not applicable

Table 3

2nd assay: Inactivation of vaccinia virus by DEO-SEPT (2.0 %) and formaldehyde (0.7 %) in a quantitative suspension test at 20°C

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	2.0%	Aqua bid	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
test product	2.0%	10.0% FCS	≤3.63±0.25	≤3.50±0.00	n.d.	n.d.	≥4.13±0.43	≥4.25±0.35	n.a.	n.a.	5 min
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	7.75±0.35	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	7.75±0.00	n.a.	n.a.	n.a.	n.a.	n.a.

n.d. = not done n. a. = not applicable

Table 4

1st assay: Inactivation of vaccinia virus by DEO-SEPT (1.0 %) and formaldehyde (0.7 %) in a quantitative suspension test at 20°C

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	1.0%	Aqua bid	≤3.50±0.00	≤3.50±0.00	n.d.	n.d.	≥4.38±0.37	≥4.38±0.37	n.a.	n.a.	5 min
test product	1.0%	10.0% FCS	5.50±0.00	4.75±0.33	n.d.	n.d.	2.63±0.37	3.38±0.49	n.a.	n.a.	>15 min
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	7.25±0.33	7.25±0.38	6.00±0.38	≤4.00±0.38	0.63±0.49	0.88±0.53	1.88±0.53	≥3.88±0.53	>60 min
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	7.88±0.37	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	8.13±0.37	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.

2nd assay: Inactivation of vaccinia virus by DEO-SEPT (1.0 %) and formaldehyde (0.7 %) in a quantitative suspension test at 20°C

Table 5

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	1.0%	Aqua bid	≤3.50±0.00	≤3.50±0.00	n.d.	n.d.	≥4.25±0.33	≥4.25±0.33	n.a.	n.a.	5 min
test product	1.0%	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	5 min
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	7.75±0.33	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 6

1st assay: Inactivation of vaccinia virus by DEO-SEPT (0.5%) and formaldehyde (0.7%) in a quantitative suspension test at 20°C

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	0.5%	Aqua bid	≤3.88±0.37	≤3.63±0.25	n.d.	n.d.	≥4.00±0.52	≥4.25±0.44	n.a.	n.a.	5 min
test product	0.5%	10.0% FCS	6.63±0.25	6.63±0.41	n.d.	n.d.	1.50±0.44	1.50±0.55	n.a.	n.a.	>15 min
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	7.25±0.33	7.25±0.38	6.00±0.38	≤4.00±0.38	0.63±0.49	0.88±0.53	1.88±0.53	≥3.88±0.53	>60 min
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	7.88±0.37	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	8.13±0.37	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.

n.d. = not done n. a. = not applicable

Table 7

2nd assay: Inactivation of vaccinia virus by DEO-SEPT (0.5%) and formaldehyde (0.7%) in a quantitative suspension test at 20°C

Product	Conc.	Interfering substance	Log ₁₀ TCID ₅₀ /ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log ₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
test product	0.5%	Aqua bid	≤3.75±0.35	≤3.50±0.00	n.d.	n.d.	≥4.00±0.48	≥4.25±0.33	n.a.	n.a.	5 min
test product	0.5%	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	>15 min
Controls	Conc.	Interfering substance	Log₁₀TCID₅₀/ml with 95% level of confidence after				Reduction factor with 95% level of confidence after				≥ 4 log₁₀ reduction after
			5 min	15 min	30 min	60 min	5 min	15 min	30 min	60 min	
formaldehyde	0.7%	PBS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	Aqua bid.	n.d.	n.d.	n.d.	7.75±0.33	n.a.	n.a.	n.a.	n.a.	n.a.
virus control	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control PBS	n.a.	-	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	Aqua bid.	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.
Interference control disinf.	n.a.	10.0% FCS	n.d.	n.d.	n.d.	n.d.	n.a.	n.a.	n.a.	n.a.	n.a.

n.d. = not done n. a. = not applicable

Conclusion

Based on the experiment presented were shown the virus inactivating properties of surface desifectant Deo-Sept against vaccinia virus strain Elstree investigated by a quantitative suspension test according to the guideline of the Deutsche Vereinigung zur Bekämpfung der Viruskrankheiten eV. and the Robert Koch-Institute (RKI).

According to this test suspension a desifectant Deo-Sept was examined at 2%, 1%, and 0.5% solutions at 20°C for and 5, 15, 30, 60 minutes exposure times.

After the exposure time of 5 minutes virus reduction exceeded 4 log₁₀ step (inactivation of 99,99%) at the 2% concentration.

This inactivation activity of this enveloped virus allow to declared that Deo-Sept as having „limited virucidal” properties acording with RKI expert committee (Bundesgesundheitsbl 2004, 47:62-64) and is able to inactivated the enveloped viruses .In respect of this DeoSEpt can be use into hospital and others public and health care unites for control of viral infection diseases.

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