Endosan

Efficacy against Covid-19 (Corona Virus)

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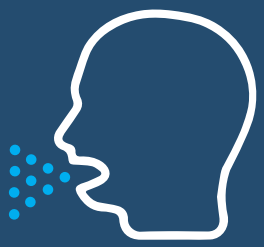
COVID-19 is an enveloped virus that probably originates from animals and is currently further transmitted between humans. The exact route of transmission is still under investigation. However it is clear that the small water droplets (aerosols) expelled during sneezing and coughing by patients contain virus particles and are a source of infection.



Personal hygiene measures are the first step in preventing the spread of viruses. Next to that, it is important to regularly clean and disinfect surfaces that may be contaminated and thereby act as transmission route. This requires a disinfectant that is able to effectively kill the pathogens.

EndoSan is a disinfectant with virucidal efficacy under clean and dirty conditions. The definition of a virucidal biocide is to reduce the amount of viruses with a log 4, this is a 10,000-fold reduction.

EndoSan is a unique and strong broad spectrum disinfectant based on hydrogen peroxide and chelated silver. This type of formulation is also called silver stabilized peroxide. Both components have a synergistic effect against viruses. EndoSan has been used globally for the disinfection of drinking systems, hard surfaces in various areas such as industry, intensive livestock industry, medical facilities, ships and residential homes.

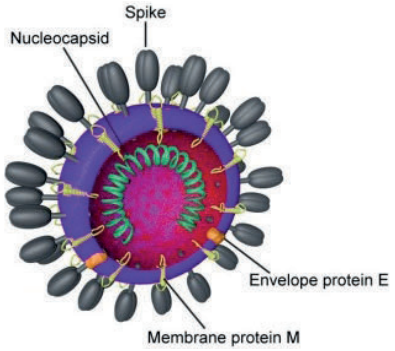


Figure 1. Diagram of COVID-19 virion structure showing spikes that form a "crown" like the solar corona, hence the name.

EndoSan is also used for decontamination and disinfection by fogging. Especially because an important transmission route of the corona virus is airborne aerosols caused by coughing, it is important to disinfect the air in rooms where carriers of the virus have been present.

PROTOCOL FOR SURFACE DISINFECTION

Use EndoSan3 with a 10 minute contact time, spray it on hard surfaces at a rate of 200 ml/m^2 using either a trigger spray bottle, a low pressure sprayer, sponge or floor mop.

For equipment disinfection, the equipment can be washed in disinfectant solution or sprayed and then wiped clean with a cloth or sponge. It is advised to wear safety eyewear during application.

PROTOCOL FOR AIR/ROOM DISINFECTION *

1. Make sure that the room is closed and no people are present.
2. Appropriate eye and respiratory protection equipment must be worn - please consult Endo Enterprises for solutions and advice.
3. Fill fogging unit with EndoSan3.
4. Fog at a rate of 35 ml/min for 15 minutes (based on 70m^3 room size).
5. Wait 1 hour and ventilate the room thoroughly.

*** Only undertake fogging of rooms with full specialist assessment and advice, fogging with disinfectant is a hazardous activity.**

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Review

Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents

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SUMMARY

Currently, the emergence of a novel human coronavirus, SARS-CoV-2, has become a global health concern causing severe respiratory tract infections in humans. Human-to-human transmissions have been described with incubation times between 2-10 days, facilitating its spread via droplets, contaminated hands or surfaces. We therefore reviewed the literature on all available information about the persistence of human and veterinary coronaviruses on inanimate surfaces as well as inactivation strategies with biocidal agents used for chemical disinfection, e.g. in healthcare facilities. The analysis of 22 studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents such as 0.05–0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective. As no specific therapies are available for SARS-CoV-2, early containment and prevention of further spread will be crucial to stop the ongoing outbreak and to control this novel infectious thread.

Introduction

A novel coronavirus (SARS-CoV-2) has recently emerged from China with a total of 45171 confirmed cases of pneumonia (as of February 12, 2020) [1]. Together with Severe Acute Respiratory Syndrome (SARS) coronavirus and Middle East Respiratory Syndrome (MERS) coronavirus [2], this is the third highly pathogenic human coronavirus that has emerged in the last two decades. Person-to-person transmission has been described both in hospital and family settings [3]. It is therefore of utmost importance to prevent any further spread in the public and healthcare settings. Transmission of coronaviruses from contaminated dry surfaces has been postulated including self-inoculation of mucous membranes of the nose, eyes or mouth [4,5], emphasizing the importance of a detailed understanding of coronavirus persistence on inanimate surfaces [6]. Various types of biocidal agents such as hydrogen peroxide, alcohols, sodium hypochlorite or benzalkonium chloride are used worldwide for disinfection, mainly in healthcare settings [7]. The aim of the review was therefore to summarize all available data on the persistence of all coronaviruses including emerging SARS-CoV and MERS-CoV as well as veterinary coronaviruses such as transmissible gastroenteritis virus (TGEV), mouse hepatitis virus (MHV) and canine coronavirus (CCV) on different types of

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inanimate surfaces and on the efficacy of commonly used biocidal agents used in surface disinfectants against coronaviruses.

Method

A Medline search has been done on January 28, 2020. The following terms were used, always in combination with "coronavirus", "TGEV", "MHV" or "CCV": survival surface (88 / 10 / 25 / 0 hits), persistence surface (47 / 1 / 32 / 0 hits), persistence hand (8 / 0 / 3 / 0 hits), survival hand (22 / 0 / 3 / 1 hits), survival skin (8 / 0 / 0 / 1 hits), persistence skin (1 / 0 / 0 / 1 hit), virucidal (23 / 3 / 3 / 1 hits), chemical inactivation (33 / 0 / 6 / 1), suspension test (18 / 0 / 0 / 0 hits) and carrier test (17 / 4 / 0 / 0 hits). Publications were included and results were extracted given they provided original data on coronaviruses on persistence (surfaces, materials) and inactivation by biocidal agents used for disinfection (suspension tests, carrier tests, fumigation studies). Data with commercial products based on various different types of biocidal agents were excluded. Reviews were not included, but screened for any information within the scope of this review.

Results

Persistence of coronavirus on inanimate surfaces

Most data were described with the endemic human coronavirus strain (HCoV-) 229E. On different types of materials it can remain infectious for from 2 hours up to 9 days. A higher temperature such as 30°C or 40°C reduced the duration of persistence of highly pathogenic MERS-CoV, TGEV and MHV. However, at 4°C persistence of TGEV and MHV can be increased to $\geq$ 28 days. Few comparative data obtained with SARS-CoV indicate that persistence was longer with higher inocula (Table I). In addition it was shown at room temperature that HCoV-229E persists better at 50% compared to 30% relative humidity [8].

Inactivation of coronaviruses by biocidal agents in suspension tests

Ethanol (78–95%), 2-propanol (70–100%), the combination of 45% 2-propanol with 30% 1-propanol, glutardialdehyde (0.5–2.5%), formaldehyde (0.7–1%) and povidone iodine

Table I
Persistence of coronaviruses on different types of inanimate surfaces

Type of surface	Virus	Strain / isolate	Inoculum (viral titer)	Temperature	Persistence	Reference
Steel	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8–24 h	
	TGEV	Unknown	10^6	4°C	$\geq$ 28 d	[22]
				20°C	3–28 d	
				40°C	4–96 h	
	MHV	Unknown	10^6	4°C	$\geq$ 28 d	[22]
				20°C	4–28 d	
				40°C	4–96 h	
	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Aluminium	HCoV	Strains 229E and OC43	5 x 10^3	21°C	2–8 h	[24]
Metal	SARS-CoV	Strain P9	10^5	RT	5 d	[25]
Wood	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
Paper	SARS-CoV	Strain P9	10^5	RT	4–5 d	[25]
	SARS-CoV	Strain GVU6109	10^6	RT	24 h	[26]
			10^5		3 h	
			10^4		< 5 min	
Glass	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Plastic	SARS-CoV	Strain HKU39849	10^5	22°-25°C	$\leq$ 5 d	[27]
	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8–24 h	
	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	SARS-CoV	Strain FFM1	10^7	RT	6–9 d	[28]
	HCoV	Strain 229E	10^7	RT	2–6 d	[28]
PVC	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Silicon rubber	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Surgical glove (latex)	HCoV	Strains 229E and OC43	5 x 10^3	21°C	$\leq$ 8 h	[24]
Disposable gown	SARS-CoV	Strain GVU6109	10^6	RT	2 d	[26]
			10^5		24 h	
			10^4		1 h	
Ceramic	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Teflon	HCoV	Strain 229E	10^3	21°C	5 d	[23]

MERS = Middle East Respiratory Syndrome; HCoV = human coronavirus; TGEV = transmissible gastroenteritis virus; MHV = mouse hepatitis virus; SARS = Severe Acute Respiratory Syndrome; RT = room temperature.

Table II
Inactivation of coronaviruses by different types of biocidal agents in suspension tests

Biocidal agent	Concentration	Virus	Strain / isolate	Exposure time	Reduction of viral infectivity (log_{10})	Reference
Ethanol	95%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.5	[29]
	85%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.5	[29]
	80%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.3	[29]
	80%	MERS-CoV	Strain EMC	30 s	> 4.0	[14]
	78%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.0	[28]
	70%	MHV	Strains MHV-2 and MHV-N	10 min	> 3.9	[30]
	70%	CCV	Strain I-71	10 min	> 3.3	[30]
2-Propanol	100%	SARS-CoV	Isolate FFM-1	30 s	≥ 3.3	[28]
	75%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.0	[14]
	75%	MERS-CoV	Strain EMC	30 s	≥ 4.0	[14]
	70%	SARS-CoV	Isolate FFM-1	30 s	≥ 3.3	[28]
	50%	MHV	Strains MHV-2 and MHV-N	10 min	> 3.7	[30]
	50%	CCV	Strain I-71	10 min	> 3.7	[30]
2-Propanol and 1-propanol	45% and 30%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.3	[29]
		SARS-CoV	Isolate FFM-1	30 s	≥ 2.8	[28]
Benzalkonium chloride	0.2%	HCoV	ATCC VR-759 (strain OC43)	10 min	0.0	[31]
	0.05%	MHV	Strains MHV-2 and MHV-N	10 min	> 3.7	[30]
	0.05%	CCV	Strain I-71	10 min	> 3.7	[30]
	0.00175%	CCV	Strain S378	3 d	3.0	[32]
Didecyldimethyl ammonium chloride	0.0025%	CCV	Strain S378	3 d	> 4.0	[32]
Chlorhexidine digluconate	0.02%	MHV	Strains MHV-2 and MHV-N	10 min	0.7–0.8	[30]
	0.02%	CCV	Strain I-71	10 min	0.3	[30]
Sodium hypochlorite	0.21%	MHV	Strain MHV-1	30 s	≥ 4.0	[33]
	0.01%	MHV	Strains MHV-2 and MHV-N	10 min	2.3–2.8	[30]
	0.01%	CCV	Strain I-71	10 min	1.1	[30]
	0.001%	MHV	Strains MHV-2 and MHV-N	10 min	0.3–0.6	[30]
	0.001%	CCV	Strain I-71	10 min	0.9	[30]
Hydrogen peroxide	0.5%	HCoV	Strain 229E	1 min	> 4.0	[34]
Formaldehyde	1%	SARS-CoV	Isolate FFM-1	2 min	> 3.0	[28]
	0.7%	SARS-CoV	Isolate FFM-1	2 min	> 3.0	[28]
	0.7%	MHV		10 min	> 3.5	[30]
	0.7%	CCV	Strain I-71	10 min	> 3.7	[30]
	0.009%	CCV		24 h	> 4.0	[35]
Glutardialdehyde	2.5%	SARS-CoV	Hanoi strain	5 min	> 4.0	[36]
	0.5%	SARS-CoV	Isolate FFM-1	2 min	> 4.0	[28]
Povidone iodine	7.5%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	4.6	[37]
	4%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	5.0	[37]
	1%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	1%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	4.3	[37]
	0.47%	SARS-CoV	Hanoi strain	1 min	3.8	[36]
	0.25%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	0.23%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	0.23%	SARS-CoV	Isolate FFM-1	15 s	≥ 4.4	[38]
	0.23%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	≥ 4.4	[38]

SARS = Severe Acute Respiratory Syndrome; MERS = Middle East Respiratory Syndrome; MHV = mouse hepatitis virus; CCV = canine coronavirus; HCoV = human coronavirus.

Table III
Inactivation of coronaviruses by different types of biocidal agents in carrier tests

Biocidal agent	Concentration	Virus	Strain / isolate	Volume / material	Organic load	Exposure time	Reduction of viral infectivity (log_{10})	Reference
Ethanol	71%	TGEV	Unknown	50 µl / stainless steel	None	1 min	3.5	[39]
	71%	MHV	Unknown	50 µl / stainless steel	None	1 min	2.0	[39]
	70%	TGEV	Unknown	50 µl / stainless steel	None	1 min	3.2	[39]
	70%	MHV	Unknown	50 µl / stainless steel	None	1 min	3.9	[39]
	70%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	> 3.0	[40]
	62%	TGEV	Unknown	50 µl / stainless steel	None	1 min	4.0	[39]
	62%	MHV	Unknown	50 µl / stainless steel	None	1 min	2.7	[39]
Benzalkoniumchloride	0.04%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	< 3.0	[40]
Sodium hypochlorite	0.5%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	> 3.0	[40]
	0.1%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	> 3.0	[40]
	0.06%	TGEV	Unknown	50 µl / stainless steel	None	1 min	0.4	[39]
	0.06%	MHV	Unknown	50 µl / stainless steel	None	1 min	0.6	[39]
	0.01%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	< 3.0	[40]
Glutardialdehyde	2%	HCoV	Strain 229E	20 µl / stainless steel	5% serum	1 min	> 3.0	[40]
Ortho-phtalaldehyde	0.55%	TGEV	Unknown	50 µl / stainless steel	None	1 min	2.3	[39]
	0.55%	MHV	Unknown	50 µl / stainless steel	None	1 min	1.7	[39]
Hydrogen peroxide	Vapor of unknown concentration	TGEV	Purdue strain type 1	20 µl / stainless steel	None	2–3 h	4.9–5.3*	[41]

TGEV = transmissible gastroenteritis virus; MHV = mouse hepatitis virus; HCoV = human coronavirus; *depending on the volume of injected hydrogen peroxide.

(0.23–7.5%) readily inactivated coronavirus infectivity by approximately 4 $\log_{10}$ or more. (Table II). Sodium hypochlorite required a minimal concentration of at least 0.21% to be effective. Hydrogen peroxide was effective with a concentration of 0.5% and an incubation time of 1 min. Data obtained with benzalkonium chloride at reasonable contact times were conflicting. Within 10 min a concentration of 0.2% revealed no efficacy against coronavirus whereas a concentration of 0.05% was quite effective. 0.02% chlorhexidine digluconate was basically ineffective (Table II).

Inactivation of coronaviruses by biocidal agents in carrier tests

Ethanol at concentrations between 62% and 71% reduced coronavirus infectivity within 1 min exposure time by 2.0–4.0 $\log_{10}$. Concentrations of 0.1–0.5% sodium hypochlorite and 2% glutardialdehyde were also quite effective with $>$ 3.0 $\log_{10}$ reduction in viral titre. In contrast, 0.04% benzalkonium chloride, 0.06% sodium hypochlorite and 0.55% ortho-phtalaldehyde were less effective (Table III).

Discussion

Human coronaviruses can remain infectious on inanimate surfaces at room temperature for up to 9 days. At a temperature of 30°C or more the duration of persistence is shorter. Veterinary coronaviruses have been shown to persist even longer for 28 d. Contamination of frequent touch surfaces in healthcare settings are therefore a potential source of viral transmission. Data on the transmissibility of coronaviruses from contaminated surfaces to hands were not found. However, it could be shown with influenza A virus that a contact of 5 s can transfer 31.6% of the viral load to the hands [9]. The transfer efficiency was lower (1.5%) with parainfluenza virus 3 and a 5 s contact between the surface and the hands [10]. In an observational study, it was described that students touch their face with their own hands on average 23 times per h, with contact mostly to the skin (56%), followed by mouth (36%), nose (31%) and eyes (31%) [11]. Although the viral load of coronaviruses on inanimate surfaces is not known during an outbreak situation it seem plausible to reduce the viral load on surfaces by disinfection, especially of frequently touched surfaces in the immediate patient surrounding where the highest viral load can be expected. The WHO recommends "to ensure that environmental cleaning and disinfection procedures are followed consistently and correctly. Thoroughly cleaning environmental surfaces with water and detergent and applying commonly used hospital-level disinfectants (such as sodium hypochlorite) are effective and sufficient procedures." [12] The typical use of bleach is at a dilution of 1:100 of 5% sodium hypochlorite resulting in a final concentration of 0.05% [13]. Our summarized data with coronaviruses suggest that a concentration of 0.1% is effective in 1 min (Table III). That is why it seems appropriate to recommend a dilution 1:50 of standard bleach in the coronavirus setting. For the disinfection of small surfaces ethanol (62–71%; carrier tests) revealed a similar efficacy against coronavirus. A concentration of 70% ethanol is also recommended by the WHO for disinfecting small surfaces [13].

No data were found to describe the frequency of hands becoming contaminated with coronavirus, or the viral load on hands either, after patient contact or after touching contaminated surfaces. The WHO recommends to preferably apply alcohol-based hand rubs for the decontamination of hands, e.g. after removing gloves. Two WHO recommended formulations (based on 80% ethanol or 75% 2-propanol) have been evaluated in suspension tests against SARS-CoV and MERS-CoV, and both were described to be very effective [14]. No in vitro data were found on the efficacy of hand washing against coronavirus contaminations on hands. In Taiwan, however, it was described that installing hand wash stations in the emergency department was the only infection control measure which was significantly associated with the protection from healthcare workers from acquiring the SARS-CoV, indicating that hand hygiene can have a protective effect [15]. Compliance with hand hygiene can be significantly higher in an outbreak situation but is likely to remain an obstacle especially among physicians [16–18]. Transmission in healthcare settings can be successfully prevented when appropriate measures are consistently performed [19,20].

Conclusions

Human coronaviruses can remain infectious on inanimate surfaces for up to 9 days. Surface disinfection with 0.1% sodium hypochlorite or 62–71% ethanol significantly reduces coronavirus infectivity on surfaces within 1 min exposure time. We expect a similar effect against the SARS-CoV-2.

Conflict of interest statement
None declared.

Funding Sources
None.

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TRANSLATION

INSTITUTE FOR APPLIED ANIMAL HYGIENE
DEPARTMENT Cleaning/Disinfection

EBERSWALDE. 26.06.91

REPORT
- on the virucidal efficacy of the disinfectant EndoSan

As per order dated 08.03.1991, ENDOSAN® has been tested for its virucidal efficacy from April until June 1991, in accordance with the Guidelines of the DVG, 2nd Edition 1988, Section 3 (Tests on Viruses). The results of the investigation permit the following assessment of the virus-deactivating efficacy of the prepara1ion.

1. PRODUCT DESCRIPTION

According to manufacturer's data, the action of the Disinfectant ENDOSAN® is based on silver-stabilized hydrogen peroxide. The concentrate is a colourless, slightly pungent and caustic liquid which does not foam and which presents no problems when diluting with water. From approximately 1 Vol. % upwards, aqueous ENDOSAN® solutions exhibit an opalescent light cloudiness which increases with the strength of concentration.

2. MATERIAL AND METHOD

Table 1 contains data pertaining to the test-viruses employed and the associated cell-culture systems. 1 ml-test tube cell-cultures (inoculation with 0.1 ml proof-suspension, 30 min. adsorption-time, 1 ml maintenance medium) served to prove the presence of viruses.
Methodical details which supplement the DVG-Standard are preceding the depicted test-results.

Table 1 :

Test-Virus	Virus-Symbol	Cell-systems for Virus -Culture and Virus Proof	Type of proof of virus presence
Newcastle Disease.V St.Montana (encaps.)	ND	primary HEF. 2 d test tube monolayer	CPE-dianostic 3 d.p.i.,
Vaccinia-V St.Eistree (encaps.)	VACC	primary HEF. 2 d Test tube monolayer	CPE-djagnostic 4 d.p.i..
ECHO-V St. LCR 4 (not encaps.)	ECHO	sub-cultivated foetal calf lungs (FKL) 3 d test tube monolayer	CPE-dajgnostic up to 5 d.p-i.
REO-V. Type 1 (not encaps.)	REO	Vero (Monkey.kidney) cells, freshly sown test tubes	CPE-diagnostic up to 6 d.p.i.

3. PRELIMINARY EXAM1NATION

3.1. pH-Values of the reaction mixture (Table 2)

The Beckmann 32 pH-Meter was used to determine the pH-values. Measurements conducted with the Combination-Electrode 39846. The preparation of the reaction mixture took place analogous to the suspension test with and without protein-load (calf-serum) with thermally deactivated virus suspensions:

1. Dilution of the disinfectant with standard hardness water (WSH 17^0dH) to the 10-Fold End-Concentration.

2. Preparation of the reaction mixtures in 2 variants per test-virus and disinfectant:

without calf-serum :	1.0 ml Virus suspension
	+ O.8 ml Phosphate-buffered salt solution
	+ 0.2 ml disinfectant solution
with calf-serum	1.0 ml virus suspension
	+0.8 ml calf -serum
	+0.2 ml disinfectant solution

The results of the pH-value determinations are listed in Table 2.

Table 2

Virus	Protein-load	pH-contr. no ENDOSAN®	pH-values at % ENDOSAN® in preparation 0,5%	1,0%	2,0%	3.0%	4,0%
.							
ND	without	8.09	7.96	7.89	7.80	7.75	7.71
	with	8.21	8,18	8.19	8.17	8.12	8.17
VACC	w/o	8.35	8.,03	8.02	7.93	7.95	7.88
	with	8.37	8,31	8.37	8.30	8.32	8.25
ECHO	w/o	8.33	8.16	8.10	7.99	7.99	7.91
	with	8,36	8.29	8.33	8.29	8.26	8.22
REO	w/o	7.61	7.55	7.49	7.52	7.35	7.37
	with	7.99	7.92	7.94	7.89	7.91	7.92
without water*	w/o	7.53	6.91	6.60	6.37	6.15	5.74

* Instead of disinfectant solution the pH control contains water of standard hardness

The pH-values of all measured reaction mixtures and Water/SH do not lie far from the neutral point. The slight concentration-dependant acidification through ENDOSAN® in the water/SH-control in the respective reaction mixtures hardly occurs because of the buffering effect of the virus suspensions, the PBS (phosphate buffered saline) and the calf-serum. Consequently the pH-values of all perpetrations with virus suspensions wi1h or wi1hou1 calf-serum remain in the slightly basic range. An indirect virucidal effect of ENDOSAN® due to a pH-shift is, to the greatest possible extent, impossible because in the from 8.4 to 7.3 the test-bacteria remain stable

3.2 Toxicity of ENDOSAN® 846 in cell-cultures (Table 3)

The determination of the Cytotoxicity was, analogous to the suspension test, conducted as follows:

1. Dilution of the ENDOSAN® to the 10-fold End-concentration with water/Standard hardness (17^0dh)

2. Continued dilution into two variants:
   a: 1 part Tenfold-concentration
   +9 parts water/standard hardness (WSH)

   b: 1 part Tenfold-concentration
   +5 parts water/standard hardness
   +4 parts foetal calf-serum (FKS)

Of each mixture the 10-2 and 10.3 dilutions were prepared in PBS (Phosphate buffered saline), from that 4 each 1 ml- Test tube cell cultures were inoculated with 0,1 and observed for cytotoxic reactions for a period of 3 to 5 days.

The results listed in Table 3 indicate a low to moderate Cytotoxicity, a fact which enabled a virucidal-test without a detoxification-step. A chicken-embryo-fibroblast culture proved to be relatively sensitive to ENDOSAN® and exhibited slightly toxic signs from 3% ENDOSAN® proportion in the reaction-mixture (with cell regeneration) and had showed toxic signs from 5% on. The toxic limit for HEF with a ENDOSAN® proportion in the culture-medium lies around appr. 3 to 5 ppm. and for FKL (foetal calf-lung) above 3 and for VERO-Cells above 5 ppm.

3.3 Preliminary examination of virucidal properties In suspensions tests-20ºC.

The virucidal investigations of ENDOSAN® in suspension-tests took place, in conformity with the Test-Guidelines, on the four prescribed test-viruses with and without additional protein-load. Up to 6 disinfectant-concentrations (0.1 to 4.0%) were tested in 3 contact times (15, 30 and 60 min.)

The results and details of the test-structure are depicted in Table 4.

The disinfectant of all 4 test-viruses in fluid is achieved for both load-variants within 60 minutes from 2.0% ENDOSAN® onward. Concentrations higher than 3,0% are required for disinfection within 30 minutes. The above statement is supported by the most resistant test-viruses, namely the encapsulated ND and the lipid-free ECHO Virus. ENDOSAN® deactivates the encapsulated VACC and the naked REO-Virus within 60 minutes in a 1% concentration. Overall, the protein-loading can be considered to have minimal influence on the efficacy.

4. MAIN INVESTIGATIONS OF VIRUCIDAL EFFICACY IN GERM.CARRIER. TESTS (20^0c)

The results of the Germ-carrier-tests (poplar wood and gauze coated with protein-containing virus suspension) have been listed in Table 5 for encapsulated test-viruses ND and VACC and in Table 6 for the unsheathed test-viruses ECHO and REO.

Five ENDOSAN® concentrations (0.5, 1.0, 1.5, 2.0, 3.0) were investigated at five contact-times each (30, 60, 120, 180,240 min.) in the End-Point Test Method (Proof of virus-presence on the detection-limit 1.75 to 2.50 1 g KID 50 per carrier). The starting-titre on the germ-carriers moved between 5.0 and 6.75 1 g KID 50 (= per 0.1 ml), so that the proof of a titre- reduction by approximately four decimal powers is factual.

As was to be expected, on the whole, it was easier to disinfect the gauze-germ-carriers than the wood-carriers. Consequently, the statements pertaining 10 virucidal concentrations and contact-time are based predominantly on the results on wood-carriers.

The ND-virus had the most stable behaviour in the germ-carrier-tests. 0.5% of ENDOSAN® were unable to completely deactivate ND within 4 hours.
Deactivations took place by 1.0% in three hours, by 2.0% in two hours and by 3.0% in one hour.

The second encapsulated virus proved to be significantly weaker. VACC was deactivated by ENDOSAN® by the following minimum-parameters: 0.5%/180 min., 1.0%/60min. and 2.0%/30 min.

Therefore, the test-results on ND-Virus are definitive for the recommended Listing "Limited Virucidal Properties" (Efficacy against Lipid-containing viruses).

The lipid-free (unsheathed) ECHO-virus was deactivated with the following concentrations and contact times: 0.5%/180min., 1.0%/120 min., 1.5%/60min., 3.0%/60min.

The second lipid-free test-virus reacted a little more sensitively; this is, in part, caused by the approximately 1 ZP lower starting-titre of the REO-germ-carriers: 0.5%/120 min., 1.0%/120 min., 1.5%/60 min., 2.0%/30 min.

5. OVERALL ASSESSMENT

The disinfectant ENDOSAN® , whose action-principle constitutes oxidation through the protracted splitting-off of oxygen, exhibited good virucidal properties in the Preliminary and Main Investigations, conducted in conformi1y with the current
Guidelines of The DVG.

The agent acts in the neutral to weakly basic pH range and has a relatively low Cytotoxicity. The additional protein-loading is estimated to have little to moderate influence on the virucidal effect of the agent.

Distinct differences in the efficacy against sheathed and unsheathed viruses, which occur in many products, could not be detected in ENDOSAN.

Sheathed and unsheathed viruses are equally well disinfected at 20°C by concentration from 1 to 3% in which case there is a close inverse relationship to the required contact-times (3h to 1 h).

In the application of a 1% ENDOSAN® solution a long contact-time of 3 hours is required and special attention must be paid to adequate availability of disinfectant.
For example, in immersion-disinfectant or for the disinfection of well disinfectant-wetted surfaces in humid rooms, the availability of disinfectant or active substance presents no problems.

However, during the application by wiping in dry rooms, the availability, and with that the contact time of the agent is limited by drying of the surfaces. In such cases or during the application in recently cleaned rooms (inadvertent dilution of the concentration by rinse-water) the 1% concentration of ENDOSAN® should not be employed.

As a precise formula which simultaneously promises safe virucidal efficacy, one should preferably recommend a 2% ENDOSAN® concentration with 2 hour contact time.

In summary, the following virucidal application -concentrations and contact times will be recommended for the listing of ENDOSAN® according to the tests in conformity with the guidelines of DVG governing disinfectants for surface disinfection in animal husbandry:

Column 7a, virucidal (all viruses):		2.0% I 2 hours
	or	3.0% 11 hour
Column 7b, limited virucidal capability, (sheathed viruses) :		2.0% 1 2 hours
	or	3.0% 11 hour

(signature)
Dr. sc. Peter Trenner
Expert Investigator

(signature)
Dr. med. vet. M. Klemm
Editor

Table 3 :

Toxicity of ENDOSAN® for the cellular detection system (analogous to suspension test)

Type	Dilution stage	ENDOSAN® concentration 0.5% a* b*	1.0% a b	2.0% a b	3.0% a b	4.0% a b	5.0% b	Toxicity limit with percentage portion of ENDOSAN® in the culture medium a	b
HEF	10^{-2}	- -	- -	- -	(tox)	(tox)	tox	ca .3 %	ca. 3 %
FKL	10^{-2}	- -	- -	- -	- -	no test		3 %	3 %
	10^{-3}	- -	- -	- -	- -	no test			
VERO	10_{-2}	- -	- -	- -	- -	- -	-	5 %	5 %
	10^{-3}	- -	- -	- -	- -	- -			

a* = dilution is aqua bidest, variant without serum proportion
b* = dilution is aqua bidest, variant with serum proportion
- = no toxic reaction of the cell culture
(tox) = weak toxic reaction of the culture
tox = toxic reaction of the cell culture

Table 4 :
Results of the preliminary virological test with ENDOSAN® - (Suspension Test at 20ºC +/- 1°)

Test Virus	Protein Loading	Virus Control*	Residential virus content* in the reaction mixture with EndoSan® concentration after min. contact time																	
			0.1%			0.50%			1.0%			2.0%			3.0%			4.0%		
	40%FKS60min.		15	30	60	15	30	60	15	30	60	15	30	60	15	30	60	15	30	60
ND	without	5.75	>4.5	>4.5	>4.5	>4.5	3.75	3.25	>3.5	>3.5	<1.5	>3.5	2.25	<1.5	nd	nd	nd	nd	nd	nd
	with	5.25	>4.5	>4.5	>4.5	>4.5	>4.5	3.75	>4.5	3.5	3.0	3.75	2.75	<1.5	3.0	1.75	<1.5	2.25	<1.5	<1.5
VACC	without	5.50	nd	nd	nd	2.75	2.0	<1.5	2.25	<1.5	<1.5	<1.5	1.75	<1.5	<1.5	<1.5	nd	nd	nd	nd
	with	5.25	nd	nd	nd	nd	3.25	2.25	3.50	1.75	<1.5	2.0	<1.5	<1.5	<1.5	<1.5	<1.5	nd	nd	nd
ECHO	without	6.5	nd	nd	nd	>4.5	>4.5	4.25	>4.5	>4.5	3.25	>4.5	4.0	<1.5	4.25	3.5	<1.5	nd	nd	nd
	with	6.75	nd	nd	nd	>4.5	>4.5	3.75	>4.5	4.0	3.5	>4.5	3.0	<1.5	3.75	3.0	<1.5	nd	nd	nd
REO	without	6.0	nd	nd	nd	2.75	2.25	1.75	2.0	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	nd	nd	nd
	With	5.5	nd	nd	nd	3.50	2.75	1.75	2.25	2.0	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5

* data as 1 g KID 50 per 0.1 ml, < = below detection limit, no residual virus detectable

Table 5 : Results of the Main Investigation (Germ - Carrier -Tests) with EndoSan® with sheathed Test -Viruses and Vaccina

Test Virus	Protein Loading	Vjrus Control*	Concentration of EndoSan® and contact time in minutes																					
		. O.5%					1.0%						1.5%					2,0%					3.0%	
	.....	60	120	180	240	30	60	120	180	240	30	60	120	180	240	30	60	120	180	240	30	60	120
ND	Wood	5.75	+	+	+	0	+	+	0	0	0	+	+	+	0	0	+	+	0	0	nd	+	0	0
		5.50	+	+	0	+	+	+	+	0	0	+	+	+	0	0	+	+	0	0	nd	+	0	0
Gauze		5.75	+	+	0	0	+	+	+	0	0	+	0	0	nd	nd	0	0	nd	nd	nd	0	nd	nd
		5.25	+	+	0	0	+	0	0	0	0	+	0	0	nd	nd	0	0	nd	nd	nd	0	nd	nd
VACC	Wood	5.50	+	+	0	0	+	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0
		5,25	+	0	0	0	0	0	0	nd	nd	0	0	0	nd	nd	0	0	0	nd	nd	nd	nd	nd
Gauze		5.50	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		5.25	+	0	0	0	+	0	0	nd	nd	0	0	0	nd	nd	0	0	nd	nd	nd	nd	nd	nd

+ = residual virus detected 0 = no residual virus detected nd = no test * data as 1 g KID_{50} per carrier

Table 6: Results of the Main Investigation (Germ -Carrier -Tests) with EndoSan® against unsheathed Test -Viruses ECBO and REO

Test Virus	Type of carrier	Virus Control*	Concentration of EndoSan® and contact time in minutes																					
			0.5%					1.0%				1.50%					2.0%					3.0%		
			30	60	120	180	240	30	60	120	180	240	30	60	120	180	240	30	60	120	180	240	30	60	120
ECBO	Wood	6.50	+	+	+	0	0	+	+	0	0	0	+	0	0	0	0	+	0	0	0	0	0	0	0
		5.75	+	+	+	0	0	+	+	0	0	0	+	0	0	0	0	+	0	0	0	0	+	0	0
	Gauze	6.00	+	+	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		5.75	+	+	0	0	0	+	0	0	0	0	0	0	nd	nd	0	0	nd	nd	nd	nd	nd	nd	nd
VACC	Wood	5.00	+	+	0	0	0	+	+	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0
		5.25	+	0	0	0	0	+	+	0	0	0	+	0	0	0	0	0	0	nd	nd	nd	nd	nd	nd
	Gauze	5.00	+	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	nd	nd	nd
		5.55	+	+	0	0	0	0	0	0	0	0	0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

+ = residual virus detected O = no residual virus detected nd = no test * data as 1 g KID_{50} per carrier

EndoSan 3

Safety Data Sheet

according to Regulation (EC) No. 453/2010

Date of issue: 24/11/2010 Revision date: 02/11/2016 Supersedes: 29/04/2016 Version: 1.7

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture

Product name : EndoSan 3

Synonyms : Stabilised hydrogen peroxide

Product group : Trade product

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Function or use category : Disinfectant.

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Challis MS Ltd, Europower House, Lower Road,
Cookham, Berkshire. SL6 9EH
Tele: 01628 529024 Web: www.challisagplus.com email: info@challisms.com

1.4. Emergency telephone number

No additional information available

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

Adverse physicochemical, human health and environmental effects

No additional information available

2.2. Label elements

According to EC directives or the corresponding national regulations there is no labelling obligation for this product.

2.3. Other hazards

No additional information available

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
hydrogen peroxide solution ... %	(CAS No) 7722-84-1 (EC no) 231-765-0 (EC index no) 008-003-00-9 (REACH-no) 01-2119485845-22	2.861 – 3.0	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Skin Corr. 1A, H314

Name	Product identifier	Specific concentration limits
hydrogen peroxide solution ... %	(CAS No) 7722-84-1 (EC no) 231-765-0 (EC index no) 008-003-00-9 (REACH-no) 01-2119485845-22	(35 =< C) STOT SE 3, H335 (5 =< C < 8) Eye Irrit. 2, H319 (8 =< C < 50) Eye Dam. 1, H318 (35 =< C < 50) Skin Irrit. 2, H315 (50 =< C < 70) Skin Corr. 1B, H314 (70 =< C) Skin Corr. 1A, H314 (50 =< C < 70) Ox. Liq. 2, H272 (70 =< C) Ox. Liq. 1, H271

Full text of H- and EUH-phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Do not induce vomiting. Give water to drink.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : After inhalation. Aerosols : May cause a light irritation of the throat and the upper airways.

Symptoms/injuries after ingestion : Slight irritant by ingestion.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : All extinguishing media allowed.

5.2. Special hazards arising from the substance or mixture

No additional information available

5.3. Advice for firefighters

No additional information available

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Reference to other sections (8.2/13).

6.1.2. For emergency responders

Protective equipment : Reference to other sections (8.2/13).

6.2. Environmental precautions

Dilute with water.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Clean contaminated surfaces with an excess of water.

6.4. Reference to other sections

Reference to other sections (8, 13).

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Observe normal hygiene standards. Never return spills in original containers for possible later re-use.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Emergency safety showers should be available in the immediate vicinity of any potential exposure. Observe normal hygiene standards.

Special rules on packaging : meet the legal requirements.

Packaging materials : stainless steel. aluminium. Polyethylene. Use adequate venting devices on all packages and containers.

7.3. Specific end use(s)

Refer to manufacturer/supplier for information on identified use(s).

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

EndoSan 3		
Belgium	Limit value (mg/m³)	1,4 mg/m³
Belgium	Limit value (ppm)	1 ppm

8.2. Exposure controls

Appropriate engineering controls : When using, do not eat, drink or smoke. Wash hands before break and at end of works. Avoid contact with skin, eyes, or clothing.

Personal protective equipment : Gloves. Protective goggles. Protective clothing.

Hand protection	: Gloves
Eye protection	: Safety glasses
Skin and body protection	: Protective clothing

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Liquid.
Colour	: Colourless.
Odour	: Odourless.
Odour threshold	: No data available
pH	: 3 – 4,5
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: - 2 °C
Freezing point	: No data available
Boiling point	: 101 °C
Flash point	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: No data available
Relative vapour density at 20 °C	: No data available
Relative density	: No data available
Density	: 1,01 - 1,012 g/cm³
Solubility	: No data available
Log Pow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: 1,77 mPa.s (0°C)
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Release of oxygen in contact with impurities, decomposition catalysts and incompatible substances.

10.2. Chemical stability

No additional information available

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

metals. reducers. Bases. combustible materials. Impurities. metal ions. metallic salts.

10.6. Hazardous decomposition products

No additional information available

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Skin corrosion/irritation	:	Not classified pH: 3 – 4,5
Serious eye damage/irritation	:	Not classified pH: 3 – 4,5
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Sewage disposal recommendations : Can be disposed as waste water according to local regulation.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

14.1. UN number

Not regulated for transport

14.2. UN proper shipping name

Proper Shipping Name (ADR)	:	Not applicable
Proper Shipping Name (IMDG)	:	Not applicable
Proper Shipping Name (IATA)	:	Not applicable
Proper Shipping Name (ADN)	:	Not applicable
Proper Shipping Name (RID)	:	Not applicable

14.3. Transport hazard class(es)

ADR

Transport hazard class(es) (ADR) : Not applicable

IMDG

Transport hazard class(es) (IMDG) : Not applicable

IATA

Transport hazard class(es) (IATA) : Not applicable

ADN

Transport hazard class(es) (ADN) : Not applicable

RID

Transport hazard class(es) (RID) : Not applicable

14.4. Packing group

Packing group (ADR) : Not applicable
Packing group (IMDG) : Not applicable
Packing group (IATA) : Not applicable
Packing group (ADN) : Not applicable
Packing group (RID) : Not applicable

14.5. Environmental hazards

Dangerous for the environment : No
Marine pollutant : No
Other information : No supplementary information available

14.6. Special precautions for user

14.6.1. Overland transport

14.6.2. Transport by sea

14.6.3. Air transport

14.6.4. Inland waterway transport

Not subject to ADN : No

14.6.5. Rail transport

Carriage prohibited (RID) : No

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Contains no substances with Annex XVII restrictions
EndoSan 3 is not on the REACH Candidate List
Contains no substance on the REACH candidate list
Contains no REACH Annex XIV substances

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

No additional information available

SECTION 16: Other information

Data sources : The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time tot time. Only the most recent versions may be used. Old versions must be destroyed. unless indicated ontherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheets offers no quality specification for the substances/preparations/mixtures in questions.

SDS EU (REACH Annex II)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

Challis Ag+ Shower Fitting and Cross Contamination Prevention Protocol

Effective cleaning and disinfection of medical equipment, surfaces and equipment such as showers is critical in a healthcare environment as inadequate treatment and lack of attention to standard operating procedures can cause cross contamination. With this in mind Challis Ag+ have developed our shower installation protocol.

Protocol

1. Operator ensures hands are decontaminated with appropriate hand-washer or replace gloves
2. Tools decontaminated using Challis Ag+ Tool & Surface Disinfectant. Special attention to this during ward transfer.
3. Excess Challis Ag+ Tool disinfectant wipe off with clean paper towel.
4. Old shower hose unscrewed from shower outlet, remove old washers and place all in Challis Ag+ returns box.
5. New shower & hose c/w new rubber washers presented and screwed on to shower mixer outlet. **Do not over tighten.**
6. Spray new shower and hose with Challis Ag+ Tool disinfectant ensuring full coverage of shower head, hose and fittings.
7. Excess Challis Ag+ Tool & Surface disinfectant wipe off with clean paper towel.
8. New shower & hose turned on and tested for fault free functionality and safe temperature.

Challis Ag+ Naturally Pure, Environmentally Friendly Anti Microbial Tool Disinfectant

Decontaminating hands with antimicrobial wipes or hand washes between wards is a well established protocol that has been undeniably a very effective measure in improving infection control. However the decontamination of tradesman tools as they transfer and work between wards is often overlooked and the level of risk often under considered, with in some case no protocols in place at all.

Imagine the risk involved in a tradesman working in a high bacterial load areas such as toilets or bathrooms then moving to work repairing a basin tap on a high dependancy ward. Protocols are undoubtedly in place regarding decontamination of hands but often the decontamination of tools are completely over looked and yet present the highest risk of all.

A simple and effective solution is now available from Challis Ag+ in the form of Challis Ag+ Tool & Surface disinfectant and area decontamination spray in convenient and easy to use 500ml & 1.0 litre spray bottles. Naturally Pure, environmentally friendly Challis Ag+ Tool disinfectant gives complete Anti Microbial control solution for rapid and safe disinfection of fittings pipe sections working equipment tools and surfaces

One application over tools, fittings or surfaces between transfers will quickly, safely and completely decontaminate. Ensuring that no areas of work are bacterially compromised and maintaining the high level of infection control required and expected. Providing your patients with a safe, clean, risk free environment.

Challis Tool & Surface Disinfectant Available in 500ml & 1.0 Litre Spray Bottles info@challisms.com
To Order Tele: 01628 529024

The original and most advanced silver stabilised hydrogen peroxide.

Challis Ag+ Tool & Surface Disinfectant is a powerful, highly effective, broad spectrum disinfectant that is both stable and safe.
Challis Ag+ Tool & Surface Disinfectant is a unique solution of Hydrogen Peroxide (H2O2) which is stabilised using a proprietary ionic silver based chemistry
When correctly applied to water, air or any surface, Challis Ag+ Tool & Surface Disinfectant will disinfect through an oxidisation process and continue to safely provide unrivalled residual performance.
Challis Ag+ Tool & Surface Disinfectant is chlorine and alcohol free, with no corrosive effects on usual materials of construction during application. After use it simply degrades into harmless water and oxygen as one of the safest forms of disinfection.

…the most developed of the silver stabilised hydrogen peroxides now available has proved particularly effective against biofilms and biofouling in water systems. Independent testing shows it provides a very wide spectrum of biocidal activity against bacteria, viruses, spores, fungi, amoebae (such as amoeba acanthus which can act as host to Legionella bacteria) and algae.

Dr T Makin
Co Author of HSE Approved Code of Practice and Guidance (ACOP) The Control of Legionella Bacteria in Water Systems (L8)

	BIOFILM REMOVAL	GERMICIDAL EFFICACY	SPORICIDAL EFFICACY	STABILITY	LOW TOXICITY IN USE	ENVIRONMENTAL PROFILE	NON CORROSIVE
EndoSan	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Chlorine Compounds	✓	✓✓✓	✗	✓	✓	✓	✗
Chlorine Dioxide	✓	✓✓✓	✗	✓	✓	✓	✓
Quats	✗	✓	✓	✓	✓✓	✓	✓
Aldehydes	✓	✓✓✓	✓	✓	✗	✓	✓✓✓
Peroxide	✓✓	✓✓	✓✓	✓	✓✓✓	✓✓✓	✓✓✓

Key Benefits

- Highly effective biofilm remover.
- Cost effective easy to apply
- Reduced HAI's
- Conforms to EN13623 and EN13626.
- Unrivalled stability.
- Forms no harmful by-products.
- Non-toxic & pH neutral when dosed.
- Proven efficacy & globally approved.
- Effective between 0°C and 95°C.
- Odour, colour and taste free.
- Three year shelf-life.
- NSF ANSI/CAN 60 Certified
- DEFRA Approved Disinfectant