Mongolian Emergency Service
Hospital Hygiene Project
MeshHp.mn

Disinfectants – situation in Mongolia and German regulations

Mongolia
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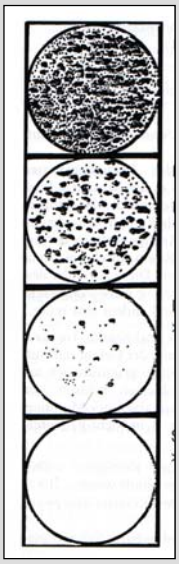
Term	Definition	Reduction factor of germs
Cleaning	Remove dirt including microorganisms (no need to kill them) by mechanical means. Mostly wiping with water (and detergents). Sometimes vacuum or high-pressure water blaster.	10 - 100
disinfection	Reduction of number of pathogenic microorganisms so that they are not enough to cause an infection.	1.000 – 100.000
Sterilisation	Killing all bacteria (including spores), mould/fungi, inactivation of all viruses.	Every sterile product has to be sterile!



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Disinfection: Examples

Eg reduction factor 10.000

10.000.000 bacteria
After disinfection: 1.000 bacteria left

1.000 bacteria
After disinfection: 0 bacteria left

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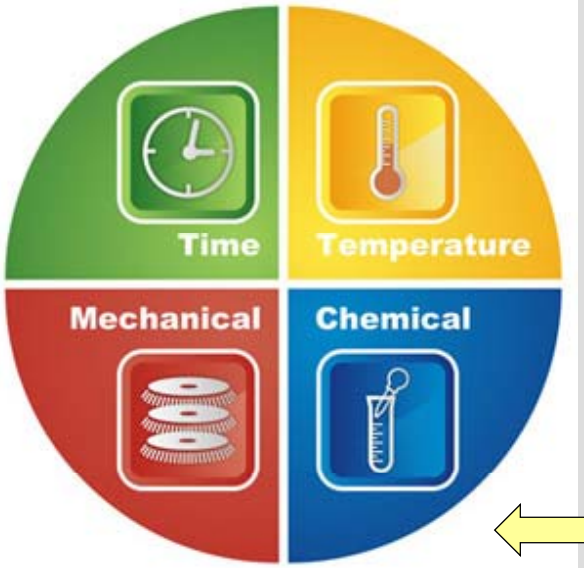
Physical disinfection methods are better than chemical ones:
Higher safety of disinfection!

Examples:
- Hot water
- Burning
- Irradiation

But:
Today they cannot be used for
- Skin
- Mucosa
- Surfaces



Examples

Hot water:
Time and temperature

Surface disinfection:
Time, chemical, mechanical

Skin disinfection:
Time, chemical, mechanical

Instrument disinfection:
Time, temperature,
(chemical), (mechanical)

Sinner Circle

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Disinfection

Disinfection of surfaces

Disinfection of medical devices (instruments)

Hand disinfection

Skin disinfection

Disinfection of mucous membranes

Washing of clothes combined with disinfection

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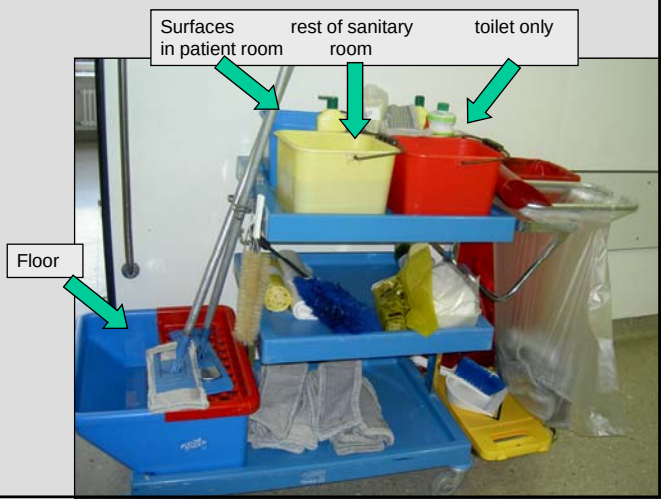
Disinfection of surfaces

Bucket with water and disinfectant
Floors (often only cleaning)
Furniture (especially near to patient)



Cold water,
use dosing aid, gloves, protective goggles, do not mix with soap oder detergents!

Better use a dosing unit

Surfaces disinfection:

- Wipe
- Concentration and exposure time according to manufacturer
- Exposure time usually not to be waited for

Aldehydes and oxygen producing agents are strongest disinfectants for surfaces.

Example of a surface disinfectant:

- Incidin plus (Ecolab)

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Disinfection of medical devices after using them

Cleaning (perhaps with disinfection, if combination of both substances is allowed by manufacturers)

↓

Disinfection

↓

Sterilisation

Best of all washer disinfectors

Second choice: manual disinfection

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Modern washer disinfectors

Cleaning + hot water (>90°C = thermal disinfection)
or
cleaning + disinfectant + hot water (60°C = chemo-thermical disinfection)

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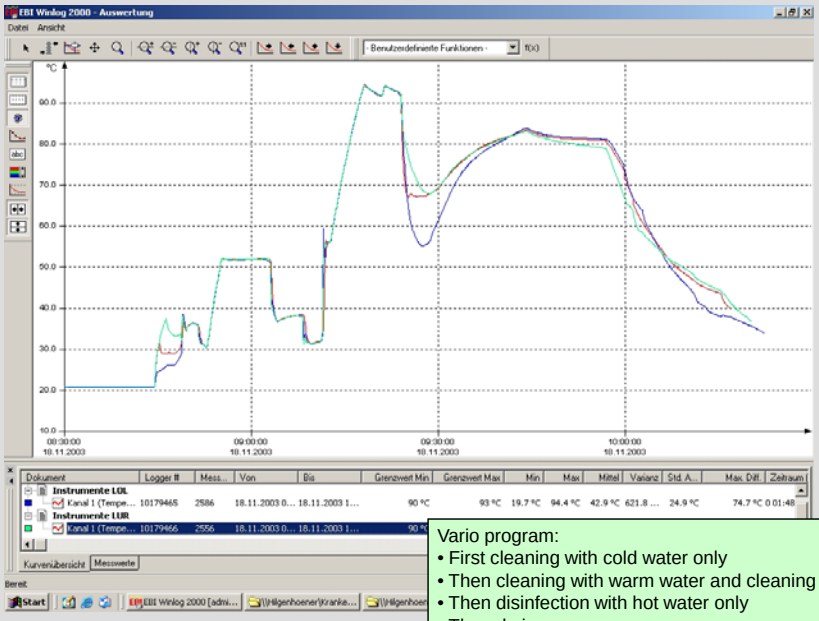
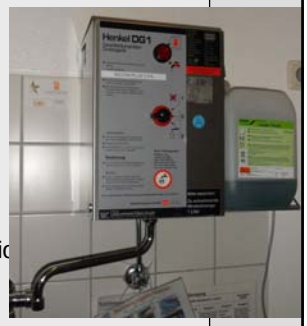


Vario program:
- First cleaning with cold water only
- Then cleaning with warm water and cleaning agent
- Then disinfection with hot water only
- Then drying

Cold water,
use dosing aid, gloves, protective goggles, do not mix with soap oder detergents!

You also can use a dosing unit



Instrument disinfection:
- Different exposure times and concentrations available
- Choose exposure time and respective concentratio
- Keep the respective exposure time
- Rinse with (demineralised) water
- Change at least daily

Example:
- Sekusept Extra N (Ecolab)

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ECOLAB®

Sekusept® Extra N

ZUSAMMENSETZUNG

In 100 g sind als Wirkstoffe enthalten:
6,0 g Glutaral, 5,0 g Benzalkoniumchlorid.

Glutaraldehyde 6 %
Quat 5 %

WIRKSAMKEIT	KONZENTRATION		EINWIRKZEIT
VAH-Liste Instrumentendesinfektion	%	ml/g/L	Min.
Gem. VAH (bakterizid, levurozid), mit hoher Belastung	1 / 2	10 / 20	60 / 15
IHO-Viruzidie-Liste	%	ml/g/L	Min.
Begrenzt viruzid * (inkl. HIV, HBV, HCV)	1	10	5
Adenoviren	1	10	5
Polyomaviren SV40	2	20	15
Viruzid *	6	60	120

* gem. RKI-Empfehlung 1/2004

According to VAH list:
1 % - 60 minutes
2 % - 15 minutes

Virucide (all viruses):
6 % - 120 minutes

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Too full:
No disinfection after short time
Not covered:
Dilution to air – irritation of mucous membranes
Concentration going down

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Left: correct
Down: not covered, not under solution surface

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Hand disinfection

Only alcoholic handrub

> 70 % alcohol (in sum) – better virus efficiacy

Dispenser with ellbow operating

30 seconds (hygienic hand disinfection)

3 minutes (surgical hand disinfection)

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Hand disinfection is extremely cheap in comparison to hospital infections!

Water solutions are recommended by WHO.
Gels might make hands rather sticky if used often (which is intended).

Examples:
- Skinman soft (Ecolab)
- Sanitas gel hand sanitizer (Monos)

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WHO-recommended handrub formulations

Formulation I

To produce final concentrations of ethanol 80% *v/v*, glycerol 1.45% *v/v*, hydrogen peroxide (H_2O_2) 0.125% *v/v*.

Pour into a 1000 ml graduated flask:

a) ethanol 96% *v/v*, 833.3 ml
b) H_2O_2 3%, 41.7 ml
c) glycerol 98% ,14.5 ml

Top up the flask to 1000 ml with distilled water or water that has been boiled and cooled; shake the flask gently to mix the content.

Formulation II

To produce final concentrations of isopropyl alcohol 75% *v/v*, glycerol 1.45% *v/v*, hydrogen peroxide 0.125% *v/v*:

Pour into a 1000 ml graduated flask:

a) isopropyl alcohol (with a purity of 99.8%), 751.5 ml
b) H_2O_2 3%, 41.7 ml
c) glycerol 98%, 14.5 ml

Top up the flask to 1000 ml with distilled water or water that has been boiled and cooled; shake the flask gently to mix the content.

Only pharmacopoeial quality reagents should be used (e.g. *The International Pharmacopoeia*) and not technical grade products.

Skin disinfection

Alcohol solutions.

15 seconds before taking blood and iv canula.

At least 1 minute (better longer) before puncture of sterile body areas,
punction of joints at least 3 minutes.

Example:
• Skinsept F (Ecolab)

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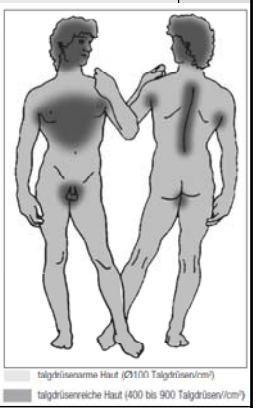
Skin disinfection before surgery

Alcoholic skin disinfectant.

Minimum 3 minutes
Region with sweat glands: up to10 minutes

Example:
- Skinsept F (Ecolab)



Dark: Rich in sweat glands

Mucous membranes disinfection

Iodine (PVP-Iodine)
Octenidin(dihydrochloride)
Polihexanid (Lavasept)
Chlorhexidine

Usually at least 3 minutes

No listing at the moment

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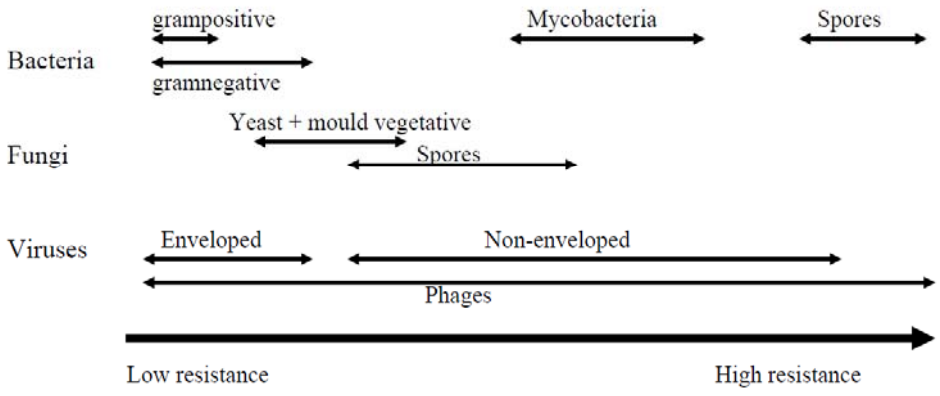
Chemicals for disinfection

Parameters influencing effectiveness of disinfection: species of microbes

Relative resistance of different microbes to biocides



Chemical	Gram + bacteria	Gram – bacteria	Enveloped viruses	Non-enveloped viruses	Myco-bacteriae	Fungi	Bacterial spores
Soaps	+	+	-	-	-	-	-
Alcohols	++	++	++	+	++	++	-
Chlorhexidine	++	+	+	+	+	+	-
Iodophores	++	++	++	+	++	++	(+)
Chlorine	++	++	++	+	++	++	(+)
Quaternary ammonium compounds (Quats)	++	+	++	(+)	-	+	-
Amines	++	+	++	(+)	++	+	-
Oxygen producing chemicals	++	++	++	++	++	++	(+)
Aldehydes	++	++	++	++	++	+	(+)
	++ effective		+ Effective with some deficits		- Not effective		

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Chemical	Inactivated by protein and blood	Inactivated by cleaning agents	corrosive	Skin damaging
Alcohols	-	-	-	-
Iodophores	(+)	+	(+)	(+)
Chlorine	++	+	+	(+)
Quaternary ammonium compounds (Quats)	+	++	-	-
Oxygen producing chemicals	++	-	++	+
Aldehydes	+	-	-	++
Action	**Change often**	**Never mix**		**Use gloves**

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Virus efficiacy

Enveloped viruses, eg
- HIV
- Hepatitis B and C
- Influenza
- Herpes
- SARS
- Most disinfectants working, e.g. alcohol

Not enveloped viruses, eg
- Norovirus
- Rotavirus
- Hepatitis A
- Papilloma Virus
- Polio
- Only aldehydes and oxygen producing substances

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Listed products in Germany

RKI list (Robert Koch Institute):
If ordered by state authorities (very seldom).
Higher concentrations and exposure times.
Standard test methods.
Available in internet freely.

VAH list (Verbund fьr Angewandte Hygiene):
More products.
Everyday concentrations and exposure times.
Standard test methods.
Products:
- Hand and skin,
- surface,
- instruments,
- clothes.

Available as book or online for money.

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Standard methods for listing in VAH

In vitro test
Testing in suspension: concentration and time

Test under „real“ conditions

Staphylococcus aureus
Enterococcus hirae
Escherichia coli K12
Proteus mirabilis
Pseudomonas aeruginosa

Candida albicans
Aspergillus niger

Mycobacterium terrae
Mycobacterium avium

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Standard methods for listing in VAH – surfaces and instruments

Staphylococcus aureus
Enterococcus hirae
Pseudomonas aeruginosa
Candida albicans
Aspergillus niger
Mycobacterium terrae
Mycobacterium avium

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Standard methods for listing in VAH – clothes

Staphylococcus aureus
Enterococcus hirae
Escherichia coli K12
Pseudomonas aeruginosa
Candida albicans
Mycobacterium terrae
Mycobacterium avium

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Standard methods for listing in VAH – hand disinfectant

Escherichia coli K12

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EN-Standard CEN TC 216 WG1 – Dez 2012

Standard test methods to be used to substantiate claims for disinfectant products - Dez 2012

Type and/or Purpose of product	Phase / Step	Activity claims							
		Bactericidal	Fungicidal	Yeasticidal	Mycobactericidal	Tuberculocidal	Virucidal		Sporicidal
Hygienic hand wash	2 / 1	EN 13727	**	prEN 13624rev	**	**	EN 14476rev	EN 14476rev (limited spect. activity)	**
	2 / 2	EN 1499	**	**	**	**	**		**
Hygienic hand rub	2 / 1	EN 13727	**	prEN 13624rev	EN 14348 enlargem.?	**	EN 14476rev	EN 14476rev (limited spect. activity)	**
	2 / 2	EN 1500	**	**	**	**	* proposal Steinmann/Eggers		**
Surgical hand rub and surgical hand wash	2 / 1	EN 13727	**	prEN 13624rev	**	**	**		**
	2 / 2	EN 12791 (WI00261058 for rev)	**	**	**	**	**		**
Surface disinfection, clean and dirty conditions	2 / 1	EN 13727	prEN 13624rev	prEN 13624rev	EN 14348	EN 14348	EN 14476rev		WI00216068 (Apr 2012)
	2 / 2	WI00216084 (Sep 2012)	*	WI00216084 (Sep 2012)	*	*	WI00216070 (Sep 2012)		* proposal Gemein/Gebel
Instrument disinfection, clean and dirty conditions	2 / 1	EN 13727	EN 13624	EN 13624	EN 14348	EN 14348	EN 14476rev		WI00216068 (Apr 2012)
	2 / 2	EN 14561	EN 14562	EN 14562	EN 14563	EN 14563	*		* proposal Gemein/Gebel
Water treatment against Legionella	2 / 1	EN 13623							
	2 / 2	**							
Chemical-thermal linen disinfection	2 / 1	prEN 13727	*	prEN 13624	EN 14348	EN 14348	*		*
	2 / 2	WI00216075 (Nov 2011)	*	WI00216075 (Nov 2011)	WI00216075 (Nov 2011)	WI00216075 (Nov 2011)	*		*

* No work items are yet approved but relevant standards may become available in the future

** No intention to develop a test

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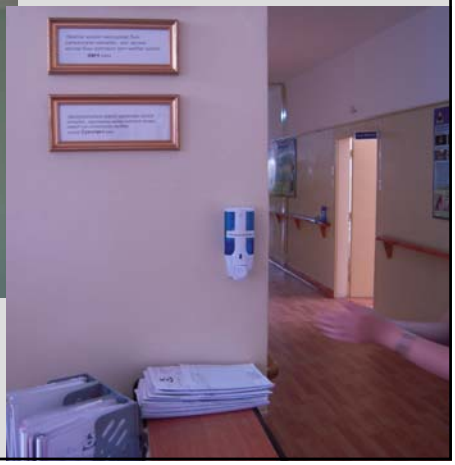
Production of alcoholic handrub solutions in 2 hospitals.

e.g. National Central Hospital: 1,052 l in 2011 – 1,521 l in 2012.

University Clinics of Essen: 1,300 beds -> 21 liters / bed and year.
National Central Hospital: 544 beds -> 11,500 liters a year.



Chloramine

Effective by setting free chlor (hypochlorite)

Europe: Chloramine T = Tosylchloramidnatrium = 25 % Chlor available

Efficiacy:
- Bacteria
- Viruses: > 2 %
  - Polio: 1 %, 4 minutes
  - Influenza: 0.5 %, 1 minute
  - HBV: 1-2 %, 30 minutes – 2 hours – so not safe
- Spores: no

Indications: Food production, animal farms, water disinfection

But high protein mistake – better use only on clean surfaces
Hands: 1-2 % - but corrosive! Alcohol more efficiant

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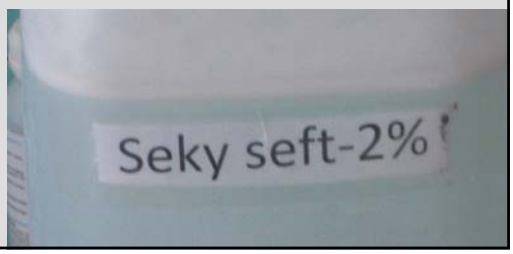
Sekusept active

Ecolab:
- Natriumpercabonate ➔ oxygen radicals
  also good cleaner

Order from May 2010:
- glutaraldehyde, formaldehyde, gliozsal

Very contradictory!



Brilliant

Russian disinfectant:
alkyldimethylbenzylammonium chloride 0.9 %, Glutaricaldehyde 0.8 %
14 days if in closed container and in a dark place
Solution: 400 ml Brilliant for 10 l of water

For comparison:
Sekusept Extra N (Ecolab) contains 6 % Glutaral
6 % solution (120 minutes, virucidal) ➔ 0.36 % aldehyde
Brilliant solution (400 ml in 10,000 ml water) ➔ 0.03 % aldehyde.
Order from May 2010: disinfection with 0.8 – 1 % ➔ < 0.01 % aldehyde

Some products in Mongolia we saw		
Name	**chemical**	**comment**
Wantia	Aldehyde	Disinfectant
Hexalkan+	Propanol, Quat	Disinfectant (+ cleaner?)
Alkazyme	Quat	Disinfectant (+ cleaner?)
Alkacide	Quat (+ Aldehyde)	Disinfectant
Cidex Opa	aldehyde	Disinfectant
Mikro Quat	Amine, alcohol	Disinfectant for kitchen
Hydrogen peroxide	Hydrogen peroxide	Cleaner (+disinfectant?)
Javelion	Chlorine?	Disinfectant?
Virkon S	Oxygen producer	disinfectant
Septodor forte	Quat, aldehyde	disinfectant

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Some products in Mongolia we saw		
Name	**chemical**	**comment**
W		
H		
Al		
Al		
Ci		
M		
Hydrogen peroxide	Hydrogen peroxide	Cleaner (+disinfectant?)
Javelion	Chlorine?	Disinfectant?
Virkon S	Oxygen producer	disinfectant
Septodor forte	Quat, aldehyde	disinfectant

Problems and questions

Are they tested according to proven standards?

Is concentration and exposure time proven?

How long is recommendation for using the solution?

Fake products?

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Conclusions

No fake products.

Only tested products (standard test – comparability).

Budget for disinfection products.

Not cheapest ones.

Use in respective concentration and exposure time.
Keep exposure time in instrument disinfection, usually not in surface disinfection.

Change daily or more often.

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Thank you for your attention!