

INFECTION PREVENTION
AND
CONTROL
II

DISINFECTION

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Terms

- **Decontamination** - disinfection procedures to eliminate contamination, ie pollution of the environment with substances with infectivity, radioactivity etc. Comes before mechanical cleaning.
- **Mechanical Cleaning** - is a set of procedures that remove dirt and reduce the number of micro-organisms.
- **Disinfection** - is a set of measures that lead to the destruction of some microorganisms by physical, chemical, or combined processes to interrupt the route of transmission from the source to the susceptible individual.
 - **Normal** protective disinfection - part of routine procedures
 - **Special** protective disinfection - at the outbreak/source of disease (continuous, final)
- **Sterilization** - a process that leads to the killing of all micro-organisms capable of reproduction, including their spores, leads to the irreversible inactivation of viruses and the killing of worms and their eggs.

Microbes
and
Environment

Environmental
factors

External environment factors

- temperature
- radiation
- lack of water
- lack of nutrients
- inappropriate pH
- chemical substance

Microbes and Environment

Effect on microbial survival

Effect on microorganisms

- all micro-organisms are not killed at the same time, there is a gradual dying
- the number of microbes killed at a certain time depends on:
 - factor intensity
 - time of action (logarithmic relationship)
 - the starting count!
 - the type of microbe
 - environmental protection
 - for chemicals - temperature

Methods of disinfection

- Physical
- Chemical
- Physico – chemical
- Biological protection



Spectrum of
disinfection
efficiency
and
labeling on the
packaging

- Bactericidal – **A**
- Virucidal - **B**:
 - partially - enveloped viruses
 - fully – non-enveloped (naked) viruses
- Sporicidní – **C**
- Fungicidal - **V** (microscopic fibrous/mycelial fungi), **Levurocidal** - *C.albicans* (V)
- Tuberculocidal - **T** (*M.tuberculosis* complex)
- Mycobactericidal - **M** (atypical mycobacteria)

- Protozoa – **P**
- Helminths – **H**
 - Efficiency is tested according to standards!

Disinfection efficiency spectrum

Examples



Rychlá dezinfekce pomocí bezalkoholových utěrek.

Naše Plus

- Vhodný k rychlé a šetrné dezinfekci malých ploch a povrchů zdravotnických prostředků otěrem
- Vhodný i na citlivé povrchy (UZV sondy, klávesnice...)
- Jednoduchá manipulace a snadné použití
- Ihned k použití
- Životnost po otevření min. 3 měsíce

Složení (účinné látky ve 100 g přípravku) – benzyl-C12-16-alkyldimethyl, chloridy 0,26 g, didecyldimethylammonium chlorid 0,26 g, C12-14-alkyl [(ethylphenyl) methyl] dimethyl, chloridy 0,26 g

Aplikace – Předem odstraňte z povrchu nebo předmětu viditelné nečistoty. Vytáhněte ubrousek z plastové dózy a stírejte jím povrch. Dbejte na důkladné smočení povrchu. Nechejte zaschnout. Používejte jen na suché a studené povrchy. Pro dezinfekci větších ploch použijte více ubrousků. Po použití dózu důkladně uzavřete.

Univerzální kapalný dezinfekční přípravek na bázi aktivního chloru.

Použití	Expozice
Dezinfekce ploch a povrchů zdravotnických prostředků	1 min.

mikrocid® sensitive wipes je vhodný také na citlivé materiály (plexiskla, lakované povrchy), inkubátory, dotykové obrazovky, ultrazvukové, sondy, apod.

Doba použitelnosti – 24 měsíců

Zdravotnický prostředek tř. IIa

Balení – Jumbo dóza 200 ks ubrousků, náhradní balení Jumbo 200 ks ubrousků

Rozměry ubrousku – 20x20 cm



Naše Plus

- Univerzální použití
- S mycími účinky
- Vhodný pro dezinfekci a mytí omyvatelných ploch a povrchů ve zdravotnictví, obecné hygieně i ostatních profesionálních oblastech.
- Pohlcuje nežádoucí pachy
- Ekonomicky výhodný

Složení (účinné látky ve 100 g přípravku) – chlornan sodný 4,7 g

Aplikace – Z ploch a předmětů předem odstraňte hrubé nečistoty. Plochy a povrchy otřete pomocí textilie (mop, utěrka apod.) smočené v pracovním roztoku. Malé, vodě odolné předměty lze ponořit do pracovního roztoku a po uplynutí doby expozice opláchnout vodou a osušit. Pracovní roztok lze na menší plochy a předměty aplikovat i postříkem. Nepoužívejte na poškozené kovové a smaltované povrchy, tkaninu, kůži, dřevo, gumu. Pozor! Přípravek má bělicí účinky.

Použití	Množství	Expozice
Dezinfekce a čištění ploch a povrchů ve zdravotnictví, potravinářství a obecné praxi	3%	15 min.
Ohnisková dezinfekce	3%	60 min.

Doba použitelnosti – 12 měsíců

Biocidní přípravek

Balení – 1 l láhev, 5 kg kanystř, 15 kg kanystř, 50 kg sud

Procedure

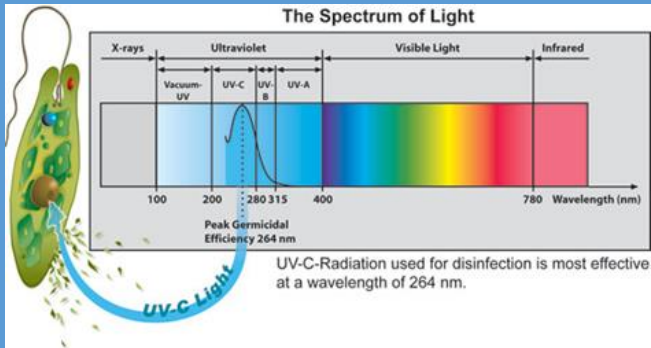
1. Mechanical cleansing
2. Disinfection itself

Can be combined using disinfectants with washing and cleaning properties.

Physical disinfection

- Disinfection in instruments at a temperature controlled/governed by **parameter Ao**. Devices must guarantee - at a given temperature - a reduction in the number of viable microorganisms on a disinfected item to a predetermined level that is suitable for items further use.
- Ultra violet radiation.
- Filtration, flame sterilization, combustion.
- Pasteurization (heating at 62.5 ° C for 30 minutes).
- Boiling at atmospheric pressure for at least 30 minutes.
- Boiling in overpressure vessels for at least 20 minutes.

Disinfection by UV radiation



Effect:

- Germicidal fluorescent lamps with a wavelength of 253.7 - 264 nm (DNA)
- It acts (is effective) on nucleic acids of microorganisms

Limited efficiency !:

Sensitive - streptococci, staphylococci, influenza virus, polio virus

Resistant - microbes sporulating and forming pigments, VHB,

HCV, HIV

- Range of microbicidal effect in air - 30 - 50 cm
- It does not penetrate the solid matter, it does not act on the shaded side
- efficient only on **clean surfaces** (dust!)

Usage (as an additional disinfection!):

1. Surface disinfection (eg laboratories)
2. Air disinfection
3. Disinfection of water



Filtration

Health applications:

- water disinfection - membrane filters (inlet water of dishwashing and disinfection equipment, shower filters to prevent legionella, ..)



shower head



- air disinfection - facial masks, respirators, HEPA filters

Physical- chemical disinfection

- **Formaldehyde steam chamber** - serves for disinfection of textile, plastic products, wool, leather and fur at a temperature of 45 to 75 °C.
- **Washing and cleaning machines** - disinfection takes place at temperatures up to 60 °C with the addition of chemical disinfectants. The time parameter is governed by the manufacturer's instructions.



Chemical disinfection

- Hydroxides and other alkalis
- Acids and some of their salts (inorganic, organic, acid esters, peroxyacids)
- Oxidizing agents (ozone, hydrogen peroxide, ...)
- Halogens (chlorine, chlorates, chloramines, bromine, iodine, ...)
- Heavy metal compounds (silver, copper, ...)
- Alcohols and ethers (ethyl alcohol, propanol, ...)
- Aldehydes (formaldehyde, glutaraldehyde, ...)
- Cyclic compounds (phenol, cresol, ...)
- Surfactants – tensides
- Combined
- New substances (octenidine dihydrochloride)

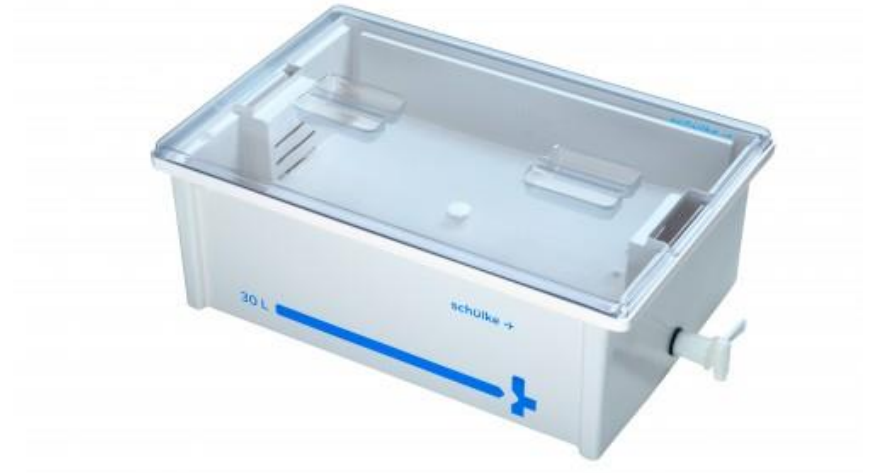
Spectrum of Disinfection Efficiency of Chemicals

Overview

Chemical compound	Chemická látka	A		B		C	T	M	V
		G+	G-	O+	O-				
Peracetic acid	Kyselina peroctová	Green	Green	Green	Green	Green	Green	Green	Green
Halogens	Halogeny	Green	Green	Green	Green	Red	Yellow	Green	Green
Alcohols	Alkoholy	Green	Green	Yellow	Yellow	Red	Yellow	Yellow	Green
Formaldehyde	Formaldehyd	Green	Green	Green	Green	Yellow	Green	Green	Green
Glutaraldehyde	Glutaraldehyd	Green	Green	Green	Green	Green	Green	Green	Green
phenol derivative	Deriváty fenolu	Green	Green	Green	Red	Red	Green	Green	Green
Quaternary ammonium compounds	KAS	Green	Yellow	Yellow	Red	Red	Red	Red	Yellow

Methods of performing the disinfection

- Immersion
- Wiping
- Spraying
- Disinfectant aerosols
- By gassing
- Evaporation
- Foam



Check of disinfection

The following methods are used to control disinfection:

- **chemical** - qualitative and quantitative method for determination of active substances and their content in disinfecting solutions,
- **microbiological** - detection of the effectiveness of disinfecting solutions or microbial contamination of disinfected surfaces (smears, imprint, rinses, etc.).

Principles of the use of disinfectants

|

- Disinfectants with **different effective chemical substances** **alternate regularly**.
- When changing the active substance, the surfaces must first be wiped with detergent water to avoid chemical reaction (stickiness, odor).
- When using disinfectants, follow the **instructions of the disinfectant manufacturer**.
- Work disinfection solutions are prepared by dissolving **the right amount** of disinfectant in water. **Prepared for each shift (12 hours) fresh** - depending on the degree of loading with biological material can be prepared even more often.

Principles of the use of disinfectants

II

- Disinfectants are diluted with **cold water**, unless otherwise specified by the manufacturer, to reduce the evaporation of chemicals into the air and their irritant effects. This applies especially to disinfectants containing **aldehydes and chlorine**.
- In the preparation of working disinfectant solutions, the supplied liquid disinfectant is considered a 100% solution.
- **The prescribed exposure time** for the disinfectant must be observed.
- **Containers** with diluted solutions of disinfectants **shall be labeled** with the name of the disinfectant, the concentration, the time of exposure, the date and the hour of dilution and the signature of the worker who diluted the solution.



Principles of the use of disinfectants

III

- Without the manufacturer's recommendations, disinfectants **should not be mixed** with other chemicals (other disinfectants or cleaning agents).
- Disinfectants and procedures of disinfection are chosen **not to damage the disinfected material**.
- Disinfected items, that come into **contact with food**, should be thoroughly rinsed with potable water after disinfection.
- **Disinfectants are stored** in original sealed containers, in dry and clean warehouses, separately from food or other chemicals

INFECTION PREVENTION AND CONTROL II

PPE AND ISOLATIONS PRECAUTIONS

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Personal protective equipment

PPE

1. Gloves
2. Mask (have to cover mouth and nose)
3. Face shield (eye protection)
4. Gown (disposable)
5. Respirator



PPE

Rules of use

- Used PPEs are disposed off as **wastes with infection risks**.
- PPEs have to be **disposed off immediately** after finishing their use.
- Disposable PPEs must **not be used repeatedly**.
- PPEs have **to be individualized**.
- PPEs at the operating theatres have to **cover also beard of surgeon**.



Possibilities of prevention

Standard precautions

the basic level of infection control precautions

to be used, as a minimum, in the care of all patients.

prevent transmission from both recognized and unrecognized sources

Isolation precautions

In specific situation

mostly aimed on recognized pathogen

differ from the way of transmission

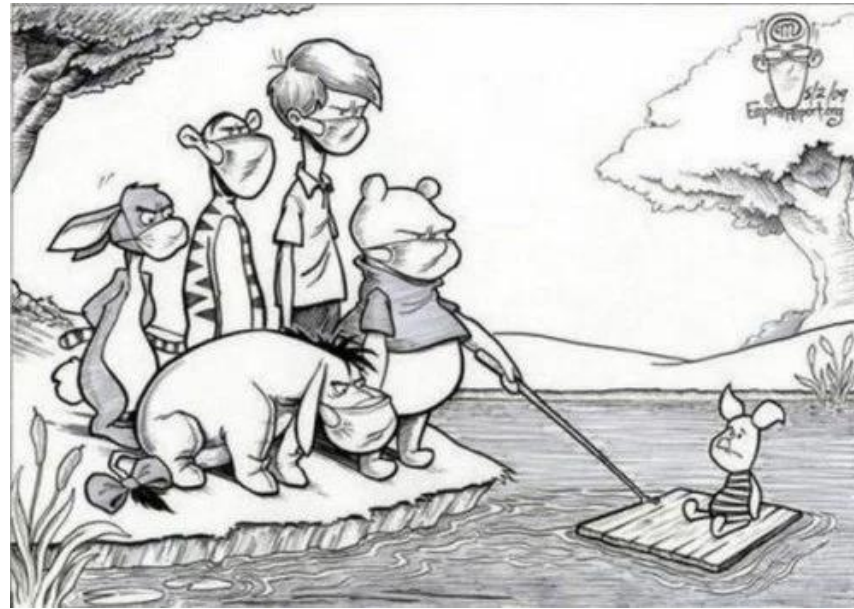
Isolation precaution

- Syndromic or empiric application (likely pathogen) of transmission-based precautions.
- Based on supposed transmission way:
 1. Contact transmission – direct, indirect
 2. Droplet transmission
 3. Airborne transmission
- **Only for interhuman transmission! (e.g. not for legionellosis)**
- Other possibilities: cohorting, keeping the patient with an existing roommate, ...
- **For all persons in a contact with patient or medical equipment!!!**

Isolation precautions

Impact on the patient

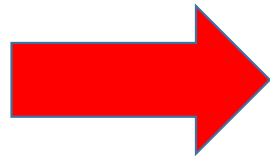
- anxiety, depression and other mood disturbances,
- perceptions of stigma,
- reduced contact with clinical staff.



Isolation precautions

Impact on the hospital ward

- Specific cleaning precaution
- Dedicated staff
- Organization of rounds (last in the sequence) and e.g. last position in daily surgical schedule
- Individualized patient-care aids
- Increased costs



Indicate individually regarding the compliance capability of the patient and local proposition.

Contact precautions



- Prevent transmission of infectious agents which are spread by direct or indirect contact with the patient or the patient's environment (MDROs, Clostridium dif., norovirus, ...)
- Patient placement: a single-patient room or in multi-patient rooms, ≥ 1 m spatial separation between beds.
- PPE: gowns, gloves



Droplet precautions



- Prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions (B. pertussis, influenza virus, adenovirus, rhinovirus, N. meningitides, and group A Streptococcus).
- Patient placement: a single patient room or spatial separation of 1.5 m and the curtain between patient beds.
- PPE: mask,....
- Patient transported outside the room: mask (if tolerated) and following Respiratory hygiene/Cough etiquette .

Airborne precautions



- Prevent transmission of infectious agents that remain infectious over long distances when suspended in the air (e.g., rubeola virus [measles], varicella virus [chickenpox], M. tuberculosis, and possibly SARS-CoV)
- Patient placement: a single-patient room that is equipped with special air handling and ventilation capacity (HEPA,...).
- Mask or respirator or other PPE, depending on the disease-specific recommendations.