

<http://mazedkivsb.lt/wp-content/uploads/2017/02/ra.png>

Koliko in kako o dezinfekcijskih sredstvih pri naravoslovnih predmetih?

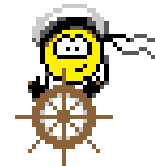
Simona Slavič Kumer in Andreja Bačnik, ZRSŠ



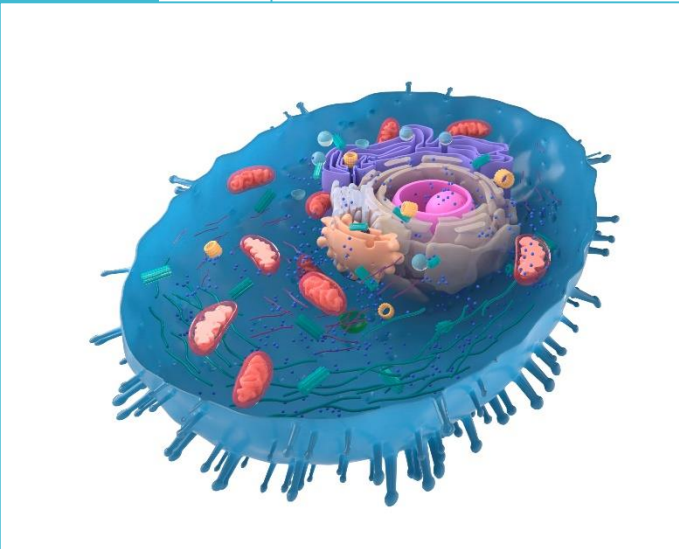
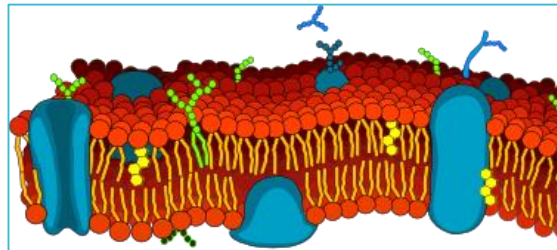
Zavod
Republike
Slovenije
za šolstvo

Cilji predstavitve:

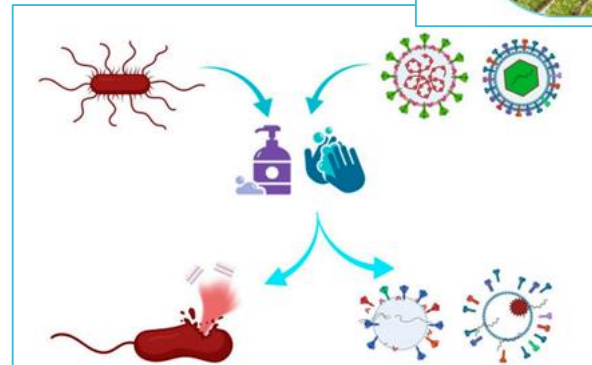
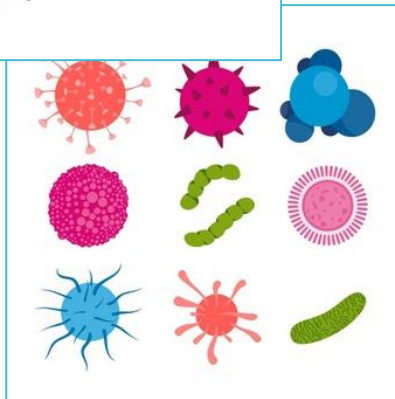
- pojavnost ciljev povezanih z dezinfekcijskimi sredstvi v UN za naravoslovne predmete
- zgodba alkoholov tudi kot dezinfekcijskih sredstev – seminar Pogovorimo se o alkoholih naravoslovno
- možne dejavnosti povezane z dezinfekcijo in njihovo vključevanje v pouk naravoslovnih predmetov (tudi v izobraževanju na daljavo)



Cilji UN za BIOLOGIJO



8., 9. razred, SŠ



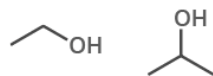
Uporaba INFOGRAFIK

A BRIEF SUMMARY OF DISINFECTANTS & ANTISEPTICS

Key: USED FOR ANTISEPSIS USED TO DISINFECT SURFACES USED FOR STERILISATION (E.G. MEDICAL INSTRUMENTS) USED FOR PRESERVATION

ALCOHOLS

USED IN ALCOHOL-BASED SANITARY HAND GELS PRESENT IN HOSPITALS



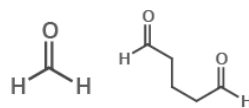
ETHANOL ISOPROPANOL



Kill many bacteria and fungi, and some viruses, when used at suitably high concentrations (usually 60-90% solution). Slow-acting, and evaporate easily, so lack residual action. Can't be used to sterilise.

ALDEHYDES

MAINLY USED FOR DISINFECTION & STERILISATION OF MEDICAL INSTRUMENTS



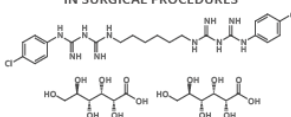
FORMALDEHYDE GLUTARALDEHYDE



Show broad activity against bacteria, fungi, and viruses. Not used for general antiseptics, due to their high toxicity. Due to the relatively long contact times required to disinfect, other agents are often preferred.

BIGUANIDES

USED IN CREAMS & FOR SKIN ANTISEPSIS IN SURGICAL PROCEDURES



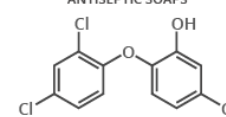
CHLORHEXIDINE DIGLUCONATE



Slow-acting, but don't evaporate easily like alcohols, so provide some residual activity. Active against most bacteria, and show some activity against fungi and viruses. Combination with alcohol increases efficacy.

BISPHENOLS

TRICLOSAN IS COMMONLY USED IN ANTISEPTIC SOAPS



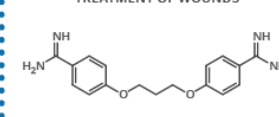
TRICLOSAN



Effective against bacteria, though more so against gram-positive bacteria. There are concerns surrounding triclosan's use in soaps due to its effects on the skin, and also due to its accumulation in the environment.

DIAMIDINES

MAINLY USED FOR THE TOPICAL TREATMENT OF WOUNDS



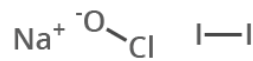
PROPAMIDINE



Less commonly used than the other featured compounds; halogenated derivatives of these compounds can also be used. Unlike some other agents, they still work in the presence of organic matter.

HALOGEN-RELEASING

MAINLY USED FOR SURFACE DISINFECTION; FOUND IN HOUSEHOLD BLEACH



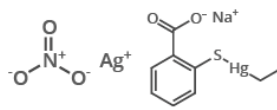
SODIUM HYPOCHLORITE IODINE



Affect bacteria, viruses, and fungi. Usually chlorine and iodine-containing compounds, with the halogens acting as oxidising agents on micro-organisms. Iodine solutions can cause irritation and staining.

METAL DERIVATIVES

RARELY USED FOR DISINFECTION, BUT CAN BE USED FOR VACCINE PRESERVATION



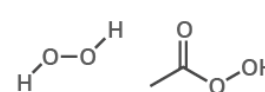
SILVER NITRATE THIOMERSAL



Silver salts are strongly bactericidal, and can be used to halt bacterial growth in burn wounds. Thiomersal is used as a preservative in some vaccines, and there are no causative links to any harmful effects.

PEROXYGENS

SUITABLE CONCENTRATIONS CAN BE USED FOR STERILISATION & ANTISEPSIS



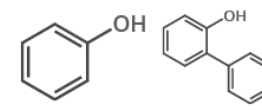
HYDROGEN PEROXIDE PERACETIC ACID



Widely used and environmentally friendly, as they decompose into safe by-products; most solutions need stabilisers to prevent decomposition. Broad spectrum of activity. Peracetic acid is the more potent.

PHENOLICS

USED FOR SURFACE DISINFECTION IN HOSPITALS AND LABORATORIES



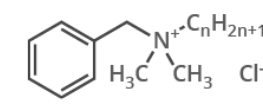
PHENOL o-PHENYLPHENOL



Phenol is no longer used as it is corrosive and carcinogenic. A number of derivatives are widely used, often for sterilising surfaces. They're partly responsible for the characteristic smell of hospitals.

QUATERNARY AMMONIUM SALTS

USED IN MANY ANTISEPTIC CREAMS AND KITCHEN SURFACE CLEANERS



BENZALKONIUM CHLORIDE



Low toxicity, so can be used to disinfect surfaces in food-handling areas. Work against gram positive bacteria and gram negative bacteria, though gram negative bacteria growth in solutions is possible.



Explorations of everyday chemical compounds

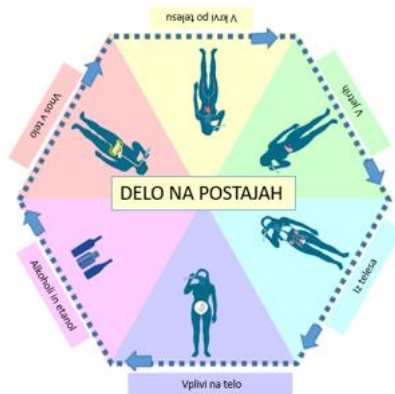


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se o alkoholih
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Delo po postajah:



ALKOHOL(I) > ETANOL

Op. min. standardi:

- alkoholov je več...
- poznajo uporabo kot topila, dezinfekcijska sredstva...

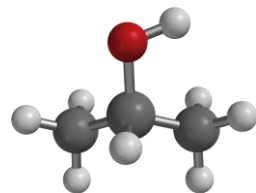
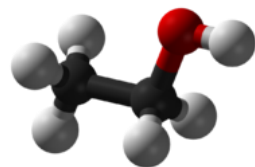
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Alkoholi in etanol

Vsebina:

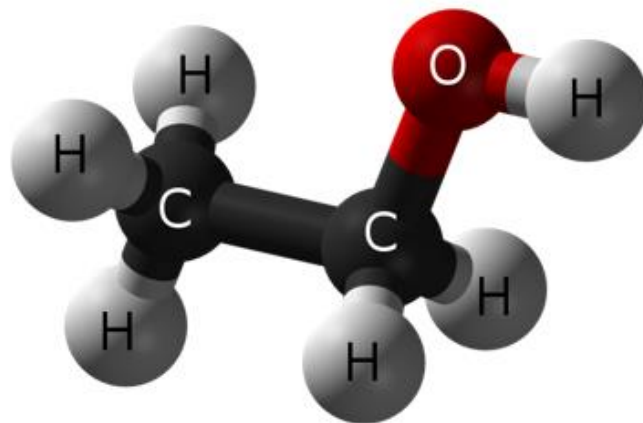
- **Vodilna dejavnosti:** Kako bi ugotovila v kateri steklenički je etanol?
- Alkoholov je več.
- Alkohol = etanol?
- Fizikalne in kemijske lastnosti etanola.



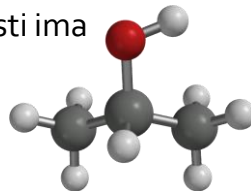
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Katere/kakšne so lastnosti etanola?



In kakšne lastnosti ima



Lastnosti	
<u>Molekulska formula</u>	C ₂ H ₅ OH
<u>Molekulska masa</u>	46,07 g/mol
<u>Videz</u>	brezbarvna tekočina
<u>Gostota</u>	0,79 g/cm ³ pri 20 °C
<u>Tališče</u>	-114 °C
<u>Vrelišče</u>	78 °C pri 101,31 Kpa
<u>Topnost (voda)</u>	popolna
<u>Topnost</u>	topen v polarnih topilih
<u>Parni tlak</u>	58,1 hPa pri 20 °C
Nevarnosti	
<u>H, P-stavki</u>	H225, H319; P210, P233
<u>Plamenišče</u>	13,7 °C ASTM D 56 zaprta posoda, 21 °C ASTM D 1310 odprta posoda
<u>Temperatura samovžiga</u>	370 °C
<u>LD₅₀</u>	8000mg/kg (podgana)vdihtavanje, 20000 mg/kg (zajec) stik s kožo, 6200mg/kg (podgana) zaužitje



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Primerjava sestave dezinfekcijskih sredstev



Vnos alkohola v telo

Od ust do črevesja
Skozi kožo

Vsebina:

- **Vodilna dejavnost: Primerjava dezinfekcijskih sredstev.**
- Dermalni vnos etanola.
- Oralni vnos etanola.
- Vplivi na absorpcijo.



Primerjajte sestavo dezinfekcijskih sredstev z alkoholi.
Predlagajte možne dejavnosti za učence.

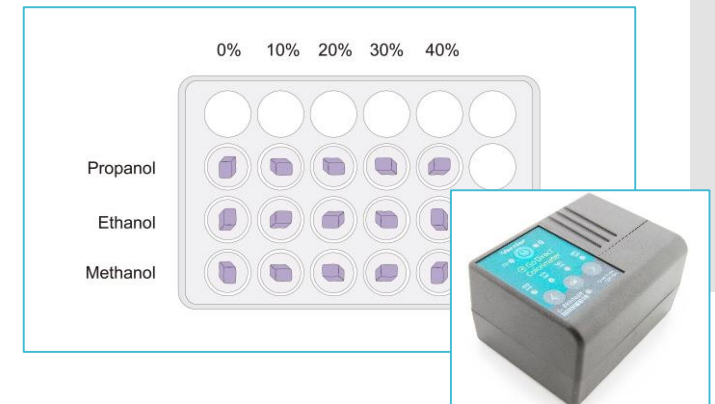
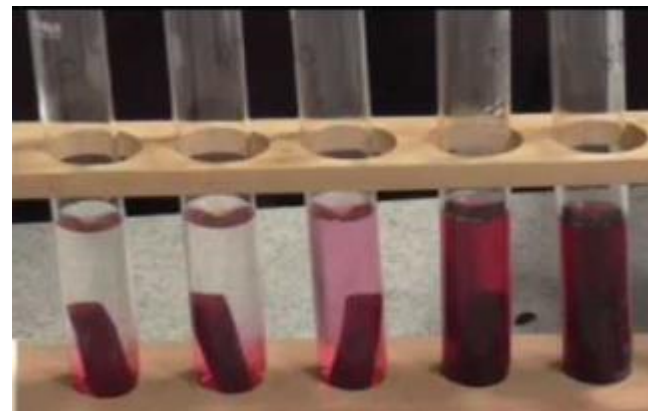
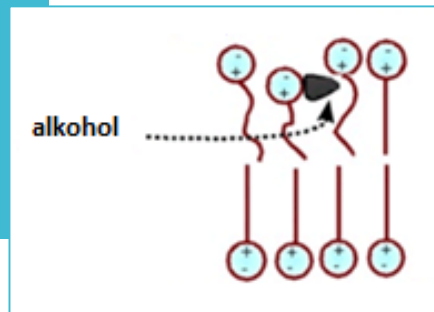


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Ali etanol lahko prehaja celično membrano in razloži učinke etanola na celično membrano?

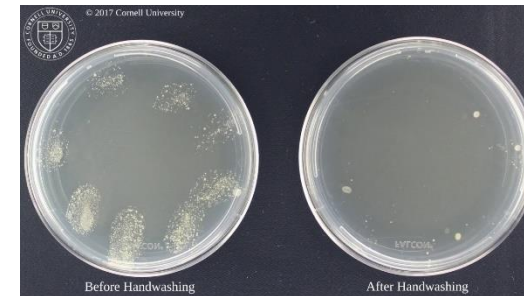
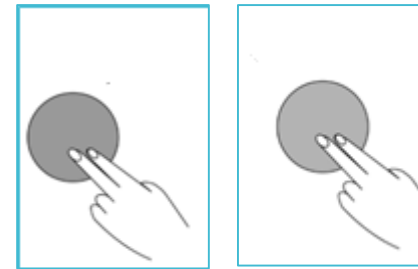


- Preglej pripravljene pripomočke in načrtuj raziskavo:
 - oblikuj raziskovalno vprašanje
 - oblikuj hipotezo
 - zapiši potek dela in načine zbiranja podatkov
- Izvedi eksperiment, (zberite podatke in oblikuj zaključke).
- Razmisli o nadgradnji eksperimenta in o prilagoditvah za učence.

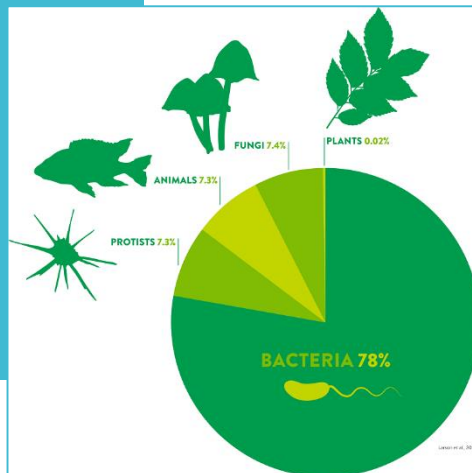


Primeri DEJAVNOSTI

**Učenje z raziskovanjem:
DEZINFEKCIJSKA
SREDSTVA IN OSEBNA
HIGIENA**



**Delo z viri, učenje z raziskovanjem:
PREUČEVANJE VPLIVA
DEZINFEKCIJSKIH SREDSTEV NA
DIVERZITETO MIKROBOV**

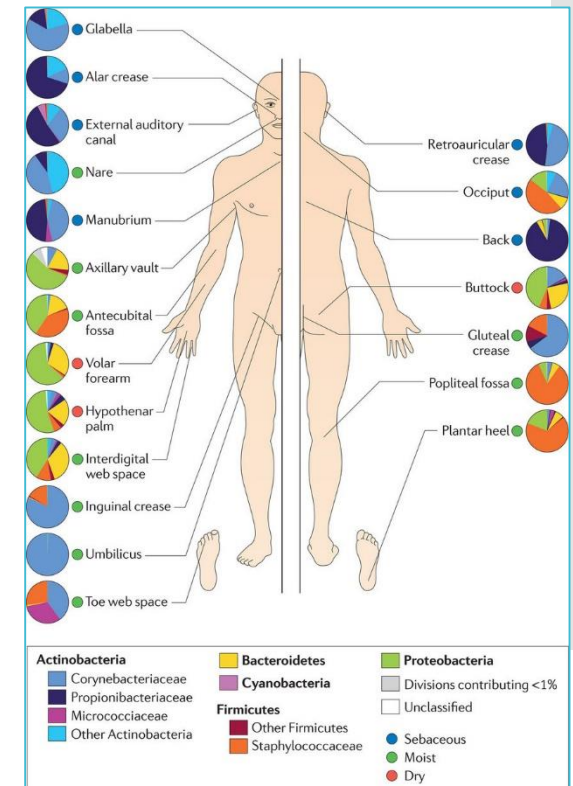


**Roberto Kotler - Microbial diversity:
How much is there and where is it
headed?
21ST EMBL SCIENCE AND SOCIETY
CONFERENCE, EMBL**



**The most important challenges ahead of
microbiome pattern in the post era of the
COVID-19 pandemic**

Hanieh-Sadat Ejtahed,^{1,2} Shirin Hasani-Ranjbar,² Seyed Davar Siadat,^{3,1} and Bagher Larjani^{3,1}



*Razvijanje procesnih znanj, kritičnega mišljenja
→ reševanje avtentičnih problemov
PRIPRAVA (DOMAČEGA) RAZKUŽILA*

Primeri DEJAVNOSTI


World Health Organization Patient Safety SAVE LIVES Clean Your Hands

Guide to Local Production: WHO-recommended Handrub Formulations

Introduction: The Guide to Local Production of WHO-recommended Handrub Formulations is separated into two discrete but interrelated sections:

Part A provides a practical guide for use at the pharmacy bench during the actual preparation of the formulation. Users may want to display the material on the wall of the production unit.

Part B summarizes some essential background technical information and is taken from WHO Guidelines on Hand Hygiene in Health Care (2009). Within Part B, the user has access to important safety and cost information and supplementary material relating to dispensers and distribution.




https://d1y1nz67w5raq8g.cloudfront.net/Pictures/78oxany/5/8/4/506584_gettyimages1216605084_101755

DOMA (manjše prostornine)

REAGENTS FOR FORMULATION 1:	REAGENTS FOR FORMULATION 2:
<ul style="list-style-type: none"> Ethanol 96% Hydrogen peroxide 3% Glycerol 98% Sterile distilled or boiled cold water 	<ul style="list-style-type: none"> Isopropyl alcohol 99.8% Hydrogen peroxide 3% Glycerol 98% Sterile distilled or boiled cold water

V LABORATORIJU (večje prostornine)

FORMULATION 1	FORMULATION 2
<ul style="list-style-type: none"> Ethanol 96%: 8333 ml Hydrogen peroxide 3%: 417 ml Glycerol 98%: 145 ml 	<ul style="list-style-type: none"> Isopropyl alcohol 99.8%: 7515 ml Hydrogen peroxide 3%: 417 ml Glycerol 98%: 145 ml



<https://www.who.int/publications/i/item/WHO-IER-PSP-2010.5>

PART A: GUIDE TO LOCAL PRODUCTION

Part A is intended to guide a local producer in the actual preparation of the formulation.

Materials required (small volume production)

REAGENTS FOR FORMULATION 1:	REAGENTS FOR FORMULATION 2:
<ul style="list-style-type: none"> Ethanol 96% Hydrogen peroxide 3% Glycerol 98% Sterile distilled or boiled cold water 	<ul style="list-style-type: none"> Isopropyl alcohol 99.8% Hydrogen peroxide 3% Glycerol 98% Sterile distilled or boiled cold water

- 10-litre glass or plastic bottles with screw-threaded stoppers (1), or
- 50-litre plastic tanks (preferably in polypropylene or high density polyethylene, translucent so as to see the liquid level) (2), or
- Stainless steel tanks with a capacity of 80–100 litres (for mixing without overflowing) (3 , 4)
- Wooden, plastic or metal paddles for mixing (5)
- Measuring cylinders and measuring jugs (6 , 7)
- Plastic or metal funnel
- 100 ml plastic bottles with leak-proof tops (8)
- 500 ml glass or plastic bottles with screw tops (8)
- An alcoholometer: the temperature scale is at the bottom and the ethanol concentration (percentage v/v) at the top (9 , 10 , 11)

NOTE

- Glycerol: used as humectant, but other emollients may be used for skin care, provided that they are cheap, widely available and miscible in water and alcohol and do not add to toxicity, or promote allergy.
- Hydrogen peroxide: used to inactivate contaminating bacterial spores in the solution and is not an active substance for hand antiseptics.
- Any further additive to both formulations should be clearly labelled and be non-toxic in case of accidental ingestion.
- A colorant may be added to allow differentiation from other fluids, but should not add to toxicity, promote allergy, or interfere with antimicrobial properties. The addition of perfumes or dyes is not recommended due to risk of allergic reactions.



Recommended amounts of products:

FORMULATION 1	FORMULATION 2
<ul style="list-style-type: none"> Ethanol 96%: 8333 ml Hydrogen peroxide 3%: 417 ml Glycerol 98%: 145 ml 	<ul style="list-style-type: none"> Isopropyl alcohol 99.8%: 7515 ml Hydrogen peroxide 3%: 417 ml Glycerol 98%: 145 ml

Step by step preparation:



- The alcohol for the formula to be used is poured into the large bottle or tank up to the graduated mark.



- The bottle/tank is then topped up to the 10-litre mark with sterile distilled or cold boiled water.



- Hydrogen peroxide is added using the measuring cylinder.



- The solution is mixed by shaking gently where appropriate or by using a paddle.



- Glycerol is added using a measuring cylinder. As glycerol is very viscous and sticks to the wall of the measuring cylinder, it should be rinsed with some sterile distilled or cold boiled water and then emptied into the bottle/tank.



- Immediately divide up the solution into its final containers (e.g. 500 or 100 ml plastic bottles), and place the bottles in quarantine for 72 hours before use. This allows time for any spores present in the alcohol or the new/re-used bottles to be destroyed.

Final products

FORMULATION 1	FORMULATION 2
Final concentrations:	Final concentrations:
<ul style="list-style-type: none"> Ethanol 80% (v/v), Glycerol 1.45% (v/v), Hydrogen peroxide 0.125% (v/v) 	<ul style="list-style-type: none"> Isopropyl alcohol 75% (v/v), Glycerol 1.45% (v/v), Hydrogen peroxide 0.125% (v/v)

Quality control

- Pre-production analysis should be made every time an analysis certificate is not available to guarantee the titration of alcohol (i.e. local production). Verify the alcohol concentration with the alcoholometer and make the necessary adjustments in volume in the preparation formulation to obtain the final recommended concentration.



- Post-production analysis is mandatory if either ethanol or an isopropanol solution is used. Use the alcoholometer to control the alcohol concentration of the final use solution. The accepted limits should be fixed to $\pm 5\%$ of the target concentration (75%–85% for ethanol).



- The alcoholometer shown in this information pamphlet is for use with ethanol; if used to control an isopropanol solution, a 75% solution will show 77% ($\pm 1\%$) on the scale at 25°C.

General information

Labelling should be in accordance with national guidelines and should include the following:

- Name of institution
- WHO-recommended handrub formulation
- For external use only
- Avoid contact with eyes
- Keep out of the reach of children
- Date of production and batch number
- Use: Apply a palmful of alcohol-based handrub and cover all surfaces of the hands. Rub hands until dry
- Composition: ethanol or isopropanol, glycerol and hydrogen peroxide
- Flammable: keep away from flame and heat

Production and storage facilities:

- Production and storage facilities should ideally be air conditioned or cool rooms. No naked flames or smoking should be permitted in these areas.
- WHO-recommended handrub formulations should not be produced in quantities exceeding 50-litres locally or in central pharmacies lacking specialised air conditioning and ventilation.
- Since undiluted ethanol is highly flammable and may ignite at temperatures as low as 10°C, production facilities should directly dilute it to the above-mentioned concentration. The flashpoints of ethanol 80% (v/v) and of isopropyl alcohol 75% (v/v) are 17.5°C and 19°C, respectively.
- National safety guidelines and local legal requirements must be adhered to the storage of ingredients and the final product.
- Additional safety information is presented in Part B of this Guide.

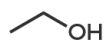
PART B: SUPPLEMENTARY TECHNICAL, SAFETY AND COST INFORMATION:

Namesto
zaključka...

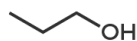
Hvala za
pozornost!

HOW HAND SANITISERS PROTECT AGAINST INFECTIONS

WHAT'S IN HAND SANITISERS?



ETHANOL

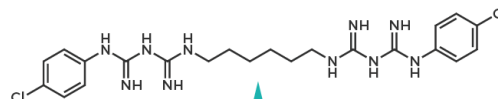


PROPANOL



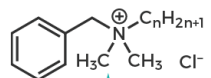
ISOPROPANOL

Alcohol-based sanitisers contain 60-95% alcohol. Most contain either ethanol, n-propanol, isopropanol, or a combination of these.

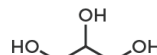


CHLORHEXIDINE

Chlorhexidine and benzalkonium chloride are also found in some sanitisers. Both are also used in non-alcohol-based sanitisers.



BENZALKONIUM CHLORIDE

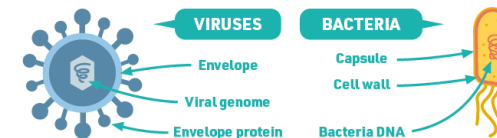


GLYCEROL

Other ingredients include glycerol, which acts as a moisturiser to stop your skin drying out. Hydrogen peroxide is added to prevent bacterial contamination in the hand sanitiser.



HOW DO HAND SANITISERS WORK?



Alcohols in hand sanitisers alter (denature) the structure of proteins. They destroy the cell wall and membranes of bacteria cells, and the envelope of viruses (including coronavirus). They're less effective against non-enveloped viruses. Non-alcohol-based sanitisers also kill bacteria but are less effective against viruses.

HOW EFFECTIVE ARE THEY?



WASH HANDS FOR 20 SECONDS

Hand washing with soap for 20 seconds washes away bacteria and viruses, and also removes dirt and grease. Antibacterial soaps are no more effective.



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