



Hand Sanitizers: An Essential Commodity in A Busy Life

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ABSTRACT

Nosocomial infection (NI) also known as hospital acquired infections, has increased attention due to the significant morbidity and mortality caused by NI worldwide. Transmission of NI is believed to occur predominantly via the mode of pathogen exchange to and from contaminated hands. Thus, maintaining clean and microbe free hands gains a lot of scientific and clinical scope. Hand sanitizer is for "hand hygiene". It is a vital principle in the prevention, control, and reduction of any acquired infection. Mainly hand sanitizer can stop the chain of transmission of micro-organisms and other bacteria from hand to different parts of our body. Hand hygiene is important and one of the most critical steps in food production, food service as well as in homes and other day care preparations. Hand sanitizer avoids adverse effects like itching, irritation, dermatitis etc. Hand sanitizer are even more important in places where there is not always going to be soap and water or at the office, in the classroom, or in any space with lots of foot traffic, germs spread quickly and other people's germs can affect you or when a health care worker has so many patients to attend to and does not have the time to wash the hands after attending to each patients. The present review was aimed to discuss the advantages, limitation and antibacterial efficacy of various hand sanitizer such as alcoholic, non- alcoholic and herbal sanitizer. The efficiency of a sanitizer depends on the concentration and grade of its active ingredient.

Keywords: Nosocomial infection, herbal hand sanitizer, herbal extract, hand hygiene, anti-microbial activity.

INTRODUCTION

Hands are primary mode of transmission of harmful germs and infections, hand hygiene is therefore the most important measure to avoid the transmission of microbes and prevent the infections. Hand hygiene is the single most important very simplest method and least expensive means of preventing nosocomial infections.¹ Contaminated hands can serve as vectors for the transmission of microorganisms. Pathogenic microorganisms accountable for outbreaks are spread from the hands of the food handler to others when the food handler contaminates his/her hands and then passes these microorganisms to consumers via hand contact with food or drinks. The consumer is exposed following the ingestion of these microorganisms, which may cause gastro intestinal illness.

Hand contact with ready-to-eat foods represents a very essential mechanism by which pathogens or microorganism may enter the food supply. Food handlers whose work involves touching unpacked foods to be consumed raw or without further cooking or other forms of dealing have been identified as a particular risk group.² To protect the skin from harmful micro-organisms and to prevent spreading of many contagious diseases, hand washing is absolutely an important precaution. Food production workers and foodservice personnel must be taught to use correct hand and fingertip washing by management in preparation for work.³



Figure 1: Gel hand sanitizer

(A person using gel hand sanitizer)

Any health-care worker or person involved in direct or indirect patient care needs to be concerned about hand cleanliness and should be able to perform it appropriately and at the right time.⁴ Last time we checked, you cannot take a sink on the go in those situation where you need to wash your hands, there is not always going to be soap and water available. You can slip a small bottle of hand rub disinfectant in your glove compartment, a purse or even your pocket for situation where you might want to wash your hands but either cannot find a sink or waiting for one is inconvenient. It is perfect for when you are grabbing a snack at a sporting event or have just left a public space like the grocery store. At the office, in the classroom, or in any space with lots of foot traffic, germs spread quickly and even if you are not getting ready to eat or taking out the garbage, other people's germs can affect you. That is why

having hand sanitizer available is ideal for group settings. Teachers, students and office workers can kill germs periodically thought out the day without having to leave their classroom, desk and gym-goers can use a squirt of hand sanitizer before hopping on the next workout machine.⁵

Hand washing eliminates visible dirt from hands and diminish the number of harmful microorganisms such as *E. coli* and Salmonella can be carried by people, animals or equipment and transmitted to food.⁶ Poor hand hygiene is the contributing factor.¹ WHO has recommended all people should wash hands before during and after preparing food, before eating food, before and after treating a cut or wound, before and after surgery, after using the toilet and changing diapers or sanitary pads, cleaning up a child who has used the toilet. After puffing your nose, coughing or sneezing, after treating for someone who is injured after handling pet food or pet treats, after touching an animal or animal waste, and after touching waste.⁷ Hand wash with detergent and water has been considered a measure of personal hygiene. The concept of cleansing hands with an antiseptic agent probably emerged in the early 19th century.⁸ Hand sanitizer is a liquid generally used to decrease harmful germs or infectious agents on the hands.⁹ Hand sanitizer also called hand antiseptic, hand rub or hand disinfectant agent applied to hand for the purpose of removal of common pathogens from hands.^{10,11} Hand sanitizer is an alternative way to hand washing. It can be used after hand wash or when soap and water are not available.¹² Sanitizers have been proven to be as effective as soap and water in reducing bacterial load from the hands even in the presence of physical dirt, soil or grease.¹³ Hand sanitizer are even more important in places where there is no clean water or when a health care worker has so many patients to attend to and does not have the time to wash the hands after attending to each patients.¹⁴ They are available in variety of mostly in gel or liquid preparation.¹³ These are antiseptic products used to avoid the transmission of skin infections or pathogens. Alcoholic based hand sanitizer kills 99% of the bacteria on hands for seconds after application. Drying of the skin is less and leaves more moisture.¹⁵



Figure 2: Hand rub disinfectant technique according to WHO guidelines.

Benefits

The chances to get ill decreases. Time taken in cleaning hands with Hand sanitizer takes second while soap takes time. It kills all bacteria and micro-organisms from our hands. Hand sanitizer is less likely to react or cause skin infections.¹⁶

Several studies have suggested that the risk of spreading gastro intestinal (stomach) and respiratory infection is reduced among families who use hand sanitizers. Hand sanitizer are very portable to use, it is very easy to carry as sometimes you won't find sink and water to wash hands. Commercially prepared hand sanitizers contain ingredients that help prevent skin dryness. Using these products can result in less skin dryness and irritation than hand washing.¹⁷

Limitations

Hand sanitizer is not safe for small children age less than 5 years. Hand sanitizer causes eyes infection. Hand sanitizer sometimes causes stomach ache and vomits. Hand Sanitizer never cleans all germs from our hands. It's best for removal of bacteria. Small amount of intake by children need medical treatment. Hand sanitizer is very flammable in nature so always keep it away from flammable substances.¹⁶

Not all hand sanitizers are created equally. Check the bottle for active ingredients. The alcohol content may be in the form of ethyl alcohol, ethanol or isopropanol. All of those are acceptable forms of alcohol. Version that contain 60 to 95% alcohol are more active when alcohol content of less than 60 percent is not sufficient to be effective. Hand sanitizer never removes visible dirt from our hands. All dust, blood and soil must be rubbed or washed away first if the alcohol in the sanitizer is to be effective. Sanitizers are most effective when used in combination with diligent hand washing.¹⁷

Commonly used ingredients in hand sanitizer

Active Ingredient

The active ingredient in hand sanitizer or hand rub disinfectant is usually an alcohol. The U.S. Food and Drug Administration and the Centers for Disease Control recommend isopropyl alcohol (IPA), ethyl alcohol or a combination of both in concentrations ranging from 60 to 95%. Alcohol is an antimicrobial that kills bacteria. Benzalkonium chloride is another FDA approved active ingredient in some hand sanitizers. Although it is not an alcohol, benzalkonium chloride also works to kill harmful bacteria and certain viruses on the hands.¹⁸

Benzalkonium chloride (alkyl dimethyl benzyl ammonium chloride)

Benzalkonium chloride is an organic compound that is used as a disinfectant and antiseptic. Benzalkonium chloride is willingly soluble in water, alcohol and acetone and effective against gram positive and gram negative bacteria. When used over extended period there can be a selection

in favour of Gram negative bacteria. It is selected in the formulation because benzalkonium chloride is one of the not dangerous synthetic biocides known and has extended history of efficacious use. The mechanism of bactericide action is thought to be due to interruption of intermolecular interactions. This can cause dissociation of cellular membrane bilayers, which negotiations cellular permeability controls and induces leakage of cellular contents.¹⁹

They are active against bacteria and some viruses, protozoa, fungi, bacterial spores are considered to be resistant. It has long been believed safe for human us and is widely used in eyewashes, mouthwashes, spermicidal creams, sanitizers and disinfectants. The formulation is specifically prepared for hand washes with low cost and high efficacy. Formulation needs great care as benzalkonium can be inactivated by certain organic compounds including soap, and must not be mixed with anionic surfactants. Hard water salts can also decrease biocides activity.¹⁹

Chlorhexidine Gluconate

Chlorhexidine Gluconate is a biguanidine derivative, used in concentrations of 0.5-4.0 % alone or in lower concentrations in combination with other compounds such as alcohols or benzalkonium chloride.²⁰ Chlorhexidine is capable against both gram positive and gram negative bacteria. The effect on fungi is flexible. pH dependency - Optimum pH is 5.5-7.0 but its workings in the range pH 5-8. pH values lower than 5 pH cause demolition of chlorhexidine whereas pH values above 8.0 causes precipitation of the Chlorhexidine.²⁰

Alcohols

Ethyl alcohol (ethanol) and isopropyl alcohols are the most frequently used alcohols. Alcohols kill vegetative forms of bacteria (including TB) and fungi but have no action on spores or viruses.^{21,22} Their effect depend on concentration 70-80% alcohol inactivates HIV and Hepatitis B in 2-10 minutes. Alcohols act rapidly by precipitate proteins and solubilise lipids present in cell membranes. Ethanol is absorbent and astringent and dries out the skin. Synergistic effect is seen when used combination with iodine, Chlorhexidine and quaternary ammonium compounds. It normally takes only 10-15 seconds for the application. If hands are drying in less than 15 seconds, it indicates that insufficient amount of alcohol disinfectant has been applied. Those solutions containing 60-95% alcohol are most active.²³

Humectants

Humectants are chemicals added to hand sanitizers or hand rub disinfectant to attract moisture or moistness to the skin surface. Glycerine and propylene glycol are humectants commonly used in these products. They help prevent your skin from drying with frequent or repeated use of hand rub disinfectant.

Emollients and Moisturizers

Isopropyl myristate is an emollient which is a chemical that seals the skin surface and makes it smoother. It is made from a substance naturally found in nutmeg, coconut oil and some animal fats. Many hand sanitizers containing isopropyl myristate and moisturizers such as *Aloe vera* and tocopherol acetate or synthetic vitamin E.

Emulsifiers

Carbomer and amniomethyl propanol are common ingredients used as binding agents. Emulsifiers keep other ingredients from separating or breaking and thicken the hand sanitizer into a gel.

Other Ingredients

Hand sanitizer manufacturers include other ingredients such as fragrance and FDA approved colorants, Herbal Extracts etc.¹⁸

Types

Alcohol based hand sanitizer

Alcohol is known to be an effective skin disinfectant compliance with general hand hygiene may improve when alcohol based products are used because use of alcohol based products are less time consuming than hand washing and products with emollient additives may be less irritating to the hands.^{23,24} Alcohol-based sanitizers typically contain some combination of isopropyl alcohol, ethanol (ethyl alcohol) or *n*-propanol. Versions that contain 60 to 95% alcohol are most active or effective. Alcohol-based hand sanitizer works against a variety of microorganisms but not spores.⁸ Alcohol-based hand sanitizer is more convenient compared to hand washing with soap and water in most situations in the healthcare setting.²⁵

It is generally more effective at killing microorganisms and better tolerated than soap and water.⁸ Hand washing should still be carried out if contamination can be seen or following the use of the toilet.²⁶ Hand sanitizer that contains at least 60 percent alcohol or contains a "persistent antiseptic" should be used.^{27,28} Alcohol rubs kill many different kinds of bacteria including antibiotic resistant bacteria and TB bacteria. 90% alcohol rubs are extremely flammable but kill or destroy many kinds of viruses including enveloped viruses such as the flu virus, the common cold virus and HIV, though is especially ineffective against the rabies virus.^{29,30,31} 90 percent alcohol based rub sanitizer are more active against viruses than most other forms of hand washing.³²

Isopropyl alcohol rub will kill 99.99 % or more of all non-spore forming bacteria in less than 30 seconds both in the laboratory and on human skin.^{27, 33} The alcoholic based hand sanitizers or hand rub disinfectant may not have the 10–15 seconds exposure time required to denature proteins and lyse cells in too low quantities (0.3 mL) or concentrations (below 60%). In environments with high lipids or protein waste (such as food processing), the use



of alcohol hand rubs alone may not be sufficient to ensure proper hand hygiene.³⁴ For health cares like hospitals and clinics, optimum alcohol concentration to kill bacteria is 70% to 95%.^{24,35} Products with alcohol concentrations as low as 40% are available in American stores, according to researchers at East Tennessee State University.³⁶ Alcohol based sanitizers kill most bacteria, fungi and stop some viruses. Alcohol rub sanitizers containing at least 70% alcohol (mainly ethyl alcohol) kill 99.9% of the bacteria on hands 30 seconds after application and 99.99% to 99.999% in one minute.³²

Advantages

Convenience

Use of an alcohol sanitizer is convenient. You can transport bottles in your pocket, purse and car or simply keep a small amount at a workstation or desk. Water or hand wash are not always immediately available including in a classroom setting or at a public sporting event. Avoid the trouble of finding a sink and washing hands or waiting in long lines in the restroom by simply carrying a small portion of sanitizer with you. The CDC recommends cleaning hands before and after eating, when preparing food or when hands are potentially contaminated with bodily fluids.

Less time

Applying hand sanitizer takes less time than washing with antimicrobial soap or liquid soap. Using a hand rub disinfectants takes about 15 seconds, according to the website Dr. Green. Washing hands takes much longer you must scrub your hands with water and soap for a minimum of 20 seconds and then dry them.

Better at killing germs

Using an alcohol-based sanitizer is more effective in reducing the spread of rotavirus, adenovirus and rhinovirus compared with medicated and non-medicated hand soaps according to studies cited by the CDC. Sanitizers studied included those with 70 percent alcohol. Pathogens such as gram-negative bacilli were less likely to transfer from patients when healthcare workers used hand sanitizers instead of regular hand washing.³⁷

Disadvantages of alcohol-based hand sanitizers

It is important to note that the FDA considers alcohol-based hand sanitizers safe to use in moderation. The problem is that alcohol-based hand rub sanitizer can lead to dry skin, infection and even alcohol poisoning. They have been deemed a fire hazard by the Occupational Health and Safety Administration (OSHA).³⁸

Alcohol toxicity

Most liquid hand rub sanitizers contain a large quantity of ethyl or isopropyl alcohol. Therefore, they should be stored out of your child's reach and only used with adult supervision. If ingested, alcohol toxicity can even lead to alcohol poisoning. In fact, from 2011 to 2015, U.S. poison control centres received nearly 85,000 calls about alcohol-

based hand sanitizer exposures among children. Studies suggest that children may be more likely to swallow hand sanitizers that are scented, brightly coloured, or attractively packaged. Older children and adults might even purposefully swallow hand sanitizers to become intoxicated. To avoid ingestion and poisoning, buy hand sanitizers with child-resistant caps, keep the sanitizers out of reach or simply purchase effective, non-alcohol hand sanitizers from a company you trust.³⁸

Dry skin and risk of infection

When used too commonly, alcohol-based hand sanitizers can wash away your skin's natural oils, which can cause drying and cracking. Dehydrated skin can be unattractive and irritating and it is likely to cause one or more of the following symptoms:

- a. Itching
- b. Slight to severe flaking, scaling, or peeling
- c. Fine lines or cracks
- d. Gray, ashy skin color
- e. Redness
- f. Deep cracks that may bleed
- g. Commercially available alcohol free hand sanitizer



Figure 3: Dry skin and cracks

Dry, cracked cuticles and skin can offer an entry point for germs to enter the body and cause infection. In addition, if you are prone to eczema, excessive dryness can activate the disease, causing redness, cracking, and inflammation. These problems are most likely to occur when your skin's normal protective mechanisms are severely compromised. For this reason, we add additional emollients (topical agents that soften the skin) to our alcohol free hand sanitizer. The emollients smooth and nourish your skin while the disinfectant rids your hands of germs and bacteria.

Fire hazard

Most hand rub sanitizers on the market contain a high volume of alcohol, enough to be careful a fire hazard. In fact, "alcoholic based hand sanitizers are classified as Class I Flammable Liquid matters, which means they have a flashpoint or breaking point of less than 100 degrees Fahrenheit". OSHA has specific guidelines regarding the storage and use of these flammable liquids:

- Clean up spilled hand sanitizer with water immediately.
- Store alcohol-based hand sanitizers away from all heat and ignition sources, including sparks, open firestorms, and electrical outlets.
- Do not allow children to use or access hand sanitizer unless properly supervised by an adult.

Store alcohol-based hand sanitizers in secure locations that do not experience extremely high temperatures.³⁸

Table 1: Commercially available alcohol based hand sanitizer

Sr. No	Commercial product	Active Ingredient
1	Forever sunshine	Ethyl Alcohol
2	Cool n cool	Ethyl alcohol
3	Lifebuoy	Ethyl alcohol
4	Safeguard	Alcohol Denat, Isopropyl alcohol
5	Blue king	Ethyl Alcohol
6	Germ X	Ethyl alcohol
7	Purell	Ethyl alcohol
8	Fresh up	Ethyl alcohol
9	Kidz n klenz	Alcohol
10	Instant foam	Ethyl alcohol
11	Mediwash	Alcohol Denat, Triclosan
12	Lana	Ethanol, Propanol
13	Inca	Ethyl alcohol
14	Dettol	Alcohol denat
15	Just cleanser	Alcohol

Alcohol free hand sanitizer

Most alcohol free sanitizer products available today come in a water-based foam. The products contain the active ingredient Benzalkonium Chloride, a quaternary ammonium.³⁹

It is selected in formulation because it is one of the safest synthetic biocides known and has a long history of efficacious use. The mechanism of bactericidal or microbicidal action is assumed to be due to disruption of intermolecular interactions. This can cause dissociation of cellular membrane bilayers, which compromises cellular permeability controls and induces leakage of cellular contents. Other bio molecular complexes within the bacterial cell can also undergo dissociation.¹⁹

Unlike alcohol-based sanitizer products, alcohol free hand rub sanitizers often contain less than a 0.1% concentration of Benzalkonium. They still provide the same level of protection. The rest of the solution is mainly water and will

often be enhanced with skin conditioners such as vitamin E and green tea extract.³⁸

Advantages

- It is non-flammable.
- The low concentrations of Benzalkonium make it relatively non-toxic.
- Alcohol free hand sanitizers are a low fire hazard.
- It is non-damaging to surfaces.
- One other clear benefit is the prolonged protection that occurs alcohol based product is ability to kill bacteria ends once the product has dried on the skin but benzalkonium based products continue to provide protection well after the solution has dried out.³⁸

Disadvantages

- Alcohol free hand sanitizers entered the market to address the concerns and complaints of gels.
- One possible drawback with the alcohol free solutions is that they most often come in the form of a foam.³⁹

Table 2: Alcohol free hand sanitizer

Sr.no	Commercial product	Active compounds
1	Nuvo	Triclosan
2	Kleen Hanz	Benzalkonium chloride, Benzithonium chloride
3	KleenHanz	Silver technology

Herbal hand sanitizer

Bacteriostatic effect of many poly herbal formulations on the bacteria present on the hands surface and on the surface of inanimate objects has been reported. Herbal hand sanitizer containing extracts of *Coleus vettiveroides*, *Coriandrum sativum*, *Citrus limon*, *Vetiveria zizanioides*, and *Azadirachta indica* was found to be safe, effective with significant bacteriostatic, cooling and astringent properties.⁴⁰ Effective hand sanitizers were developed using carbomer as a gelling agent, propylene glycol as a humectant, Cucumber extract as a cooling agent, ethyl alcohol as an anti-bacterial agent, Vitamin E as a moisturizer along with fragrance.⁴¹ Herbal hand sanitizer containing extracts of *Ocimum sanctum* and Eucalyptus globules as anti-microbial agent was found to exhibit significant activity against *E. coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus subtilis* and *Sacchomyces cerevisiae*, *Candida albicans* and safe on hands when compared to reference standards Ampicillin and Amphoterecin respectively.⁴²

Herbs with antiseptic properties

Plants are known to have various secondary metabolites with antimicrobial properties hence they have been used



comprehensively in traditional medicines since years. Some of the plants have recognised activity on skin cleaning. Their treated extracts are generally applied to disinfect skin, hands and external wounds. The most commonly used herbs with disinfectant properties are *Azdirachta indica*, *Eucalyptus robusta*, *Aloe barbadensis*, *Aloe vera*, *Berberis vulgaris*, *Cinnamomum verum*, *Piper nigrum*, *Rhamnus purshiana*, *Capsicum annuum*, *Syzygium aromaticum*, *Eucalyptus globulus*, *Withania somniferum*, *Andrographis paniculata*, *Aegle marmelos*, *Gaultheria procumbens*, *Cassia angustifolia*, etc. These plants with recognized disinfectant activity are also referred to as plant disinfectants.⁴³

Some of the plant antiseptics with their active constituents are enlisted in table 3.

Table 3: Active compounds of some herbs with disinfectant properties

Plant name	Active compounds
<i>Azdirachta indica</i>	Triterpenes, Azadirachtin.
<i>Anethum graveolens</i>	Essential oils, Phellandrene, limonene, anithofuran.
<i>Anthemis Nobilis</i>	Terpenoids, Flavonoids, Coumarins.
<i>Andrographis paniculata</i>	Andrographolides, Arabinogalactan proteins.
<i>Aegle marmelos</i>	Essential oil, Terpenoids.
<i>Arctium lappa</i>	Polyacetylene, Tannins, Terpenoids.
<i>Allium sativum</i>	Allicin, Ajoene, Sulfoxide sulfated Terpenoids.
<i>Cassia fistula</i>	Anthraquinones, Fistulic acid.
<i>Cinnamomum verum</i>	Essential oils, Terpenoids, tannins.
<i>Capsicum annuum</i>	Capsaicin, Terpenoids.
<i>Cassia angustifolia</i>	Rhein, Anthraquinones.
<i>Curcuma zedoaria</i>	Curcuminoids, Demethoxycurcumin, Terpenes.
<i>Carum carvi</i>	Coumarins.
<i>Centella asiatica</i>	Terpenoids, Asiaticoside.
<i>Camellia sinensis</i>	Flavonoids, Catechin.
<i>Citrus paradise</i>	Terpenoids.
<i>Eucalyptus globulus</i>	Tannins, Polyphenols, Terpenoids.
<i>Ficus religiosa</i>	Tannins, Saponins, Flavonoids, Terpenoids.
<i>Gaultheria procumbens</i>	Tannins, Polyphenols.
<i>Glycyrrhiza glabra</i>	Glabrol, Phenolic alcohol.
<i>Garcinia mangostana</i>	Xanthone derivatives, Mangostins.

<i>Galium odoratum</i>	Coumarins.
<i>Piper betel</i>	Catechols, Euganol, Essential oils.
<i>Punica granatum</i>	Organic acids, Phenolic compounds.
<i>Quercus rubra</i>	Tannins, Polyphenols.
<i>Rhamnus purshiana</i>	Tannins Polyphenols, Anthraquinones.
<i>Rosmarinus officinalis</i>	Essential oils, Terpenoids.
<i>Salix alba</i>	Salicin, Tannins, Phenolic glucosides.
<i>Syzygium aromaticum</i>	Eugenol, Terpenoids.
<i>Thymus vulgaris</i>	Caffeic acid, Terpenoid Thymol, Phenolic alcohol, Tannins, Polyphenols, Flavones.
<i>Ocimum basilicum</i>	Terpenoids, Essential oils.
<i>Olea europaea</i>	Aldehyde Hexanal.

Hand rub in the hospital environment have two application

1. Automatic hand sanitizer
2. Surgical hand sanitizer

Automatic hand sanitizer

The same ingredients used in hospital hand-rubs alcohols such ethanol and isopropanol sometimes combined with such as benzalkonium chloride. Benzalkonium chloride are added at levels up to 200 parts per million to increase antimicrobial effectiveness.⁴⁴

These other ingredients do not evaporate like alcohol and accumulate leaving a sticky residue until they are removed with soap and water.



Figure 4: Professional automatic hand sanitizer

The most common brands of alcohol hand rubs disinfectant include Aniosgel, Avant, Sterillium, Desderman and Allsept. All hospital hand rubs disinfectant must obey to certain regulations like EN 12054 for germ free treatment and surgical disinfection by hand-rubbing.³²

The hand sanitizer dosing systems for hospitals are designed to deliver a measured amount of the product for staff. They are dosing pumps screwed onto a bottle or are specially designed dispensers with refill bottles. Dispensers for surgical hand disinfection are usually equipped with elbow controlled mechanism or infrared sensors to avoid any contact with the pump.⁴⁴

Surgical hand disinfection

Preoperative rub in procedure by the application of a hand disinfectant before donning surgical gloves. Aims at the hands infectious or bacterial flora different studies have shown that surgical gloves are not an absolutely safe barrier against pathogen or microbes.⁴⁵

Hands must be sanitised before any surgical procedure by hand washing with mild soap and then hand rubbing with a sanitizer. Surgical disinfection requires a larger dose of the hand rub and a longer rubbing time than is normally used.⁴⁶



Figure 5: A person using surgical hand disinfectant

Toxic ingredient to be avoided in hand sanitizer and safer option for your family

Chemicals to Avoid in Hand Sanitizers

The following is a list of some toxic ingredients common in hand sanitizer, and other personal care products.

Triclosan

Here are a few more reasons to avoid products containing triclosan. Triclosan is similar to the pesticide Agent Orange and can cause reduced fertility, birth defects, and damage to major body organs. Triclosan can act as an endocrine disruptor, disturbing the delicate hormone balance of animals. Triclosan has been exposed to bio accumulate in fish and can be detected in human breast milk. Triclosan can combine with chlorine in our tap water to form the EPA classifies this gas as a potential human carcinogen.

Sodium Lauryl Sulfate, Sodium Laureth Sulfate

Sodium Lauryl Sulfate (SLS) is a common ingredient in cleanses, shampoo, liquid hand wash, and toothpaste; it is in approximately 90% of personal care products that foam. SLS is the active ingredient in garage floor cleaners, engine degreasers and industrial strength soaps. It can harm cell membranes and possibly cause hair loss. It is also related to skin and eye irritation, organ toxicity, developmental/reproductive toxicity, neurotoxicity, endocrine disruption, ecotoxicological, biochemical or cellular changes, possible mutations and cancer, as informed by the environmental working group's skin Deep database.

Parabens

Parabens are in so many skin care products, they preserve other ingredients and extend a product's shelf life. There are many types of parabens: methylparaben, butylparaben, propylparaben etc. They are also unsafe and something I avoid completely: Parabens have hormone-disrupting effects. Parabens can cause diminished muscle mass and extra fat storing. Topical parabens have been noticed in human breast tumors.

Ureas

Formerly known as diazolidinyl urea, imidazolidinyl, DMDM hydantoin, sodium hydroxyl methylglycinate, and these chemicals have several concerns related with them ureas can release formaldehyde and cause joint pain, heart irregularities and a weakened immune system. Ureas are a primary cause of contact dermatitis.

Synthetic Colors

Synthetic colors are made from coal tar. They contain heavy metal salts that may deposit toxins onto the skin causing skin sensitivity and irritation. Animal studies have exposed almost all of them to be cancer-causing.

Diethanolamine (DEA)

Diethanolamines (DEA) is used as a wetting agent in shampoos, lotions, ointments, bubble bath, and other cosmetics. It is related to cancer, developmental/reproductive toxicity, allergies /immunotoxicity and organ system toxicity.

Propylene Glycol, Propylene Oxide, Polyethylene Glycol

Propylene glycol is the main ingredient in anti-freeze and is listed on the FDA government website as a known carcinogen. It is found in hand sanitizers, moisturizers, shaving creams, deodorants and baby products. Propylene glycol weakens skin cells. It is related to cancer, developmental/reproductive toxicity, allergies/immunotoxicity and organ system toxicity.

Synthetic Fragrance

Synthetic fragrances frequently contain phthalates which are endocrine disrupters that mimic hormones and may alter genital development.

Ethyl Alcohol (Ethanol)

Ethyl alcohol is a common ingredient in hand rub disinfectant. It is connected to cancer, birth defects, developmental/reproductive toxicity and organ system toxicity.

Benzalkonium Chloride (BAC)

BAC is used in hand sanitizers and belongs to a group of disinfectants known as quats. It is linked to cancer, allergies or immune toxicity and organ system toxicity.⁴⁷

CONCLUSION

Prevention and control of infectious events are aimed to limit the spread of infection and provide a safe environment for all people, regardless of the setting. The emergence of anti-biotic resistant organism, effective infection control measures such as sanitizing are essential to prevention. Hand sanitizer used for the purpose of cleaning hands. The use of soap alone in all the situation will probably be less effective in preventing nosocomial infection. Hand rub disinfectant required less time is microbiologically more effective and is less irritating to skin than traditional hand washing with soap and water. Therefore, hand sanitizer is an effective measure to control the spread of diseases and in maintaining the hand hygiene.

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