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## A Review on Hand Sanitizer

**Shaikh Imran Ayyub , Asst.Prof.Pagire D.M.**

Pratibhatai Pawar College of Pharmacy Wadala Mahadev

### ABSTRACT:

Hygiene is an crucial issue to stop or reduce the unfold of infections. The ability to put together an alcohol-free hand sanitizer (AFHS) with antimicrobial houses is crucial, especially for the duration of pandemics, when there are excessive needs and a low grant chain for ethanol and isopropanol. The goal of this find out about used to be to put together AFHS gels primarily based on herbal substances that contain imperative oils (EOs) that would be tremendous towards a large spectrum of pathogens. The results showed that the organoleptic traits of all organized hand sanitizer gels had been considered acceptable. The pH of the formulations used to be barely acidic (circa 3.9) owing to the presence of aloe vera in massive proportions (90% v/v), which is regarded for its acidity. The spreadability for all tested formulations used to be in the appropriate range. The antimicrobial effectiveness check proven that the organized hand sanitizer gels had antimicrobial things to do in opposition to extraordinary gram-positive and gram-negative micro organism and *Candida albicans* yeast. The very best antibacterial impact was once observed with tea tree oil hand sanitizers, which lack exercise towards the yeast, whilst clove oil hand sanitizers showed effectiveness towards all microorganisms, which includes *Candida albicans*. The lavender hand sanitizer exhibited the least antimicrobial efficiency. The acceptability learn about on 20 human volunteers showed that the hand sanitizer gel containing 1.25% (v/v) clove oil did now not produce any signs and symptoms of skin irritation. This learn about recommended that the organized herbal hand sanitizer gel with 1.25% (v/v) clove oil can be a conceivable choice to usually used alcohol-based hand sanitizers (ABHS).

**Keyword:** Chlorhexidine, Chloroxynol, Iodophors, SARS, Triclosan.

### Introduction:

Hand washing is as imperative as ingesting food. It is the nice way to be healthful and to continue to be away from a variety of diseases. Soap performs an essential function in putting off dust, microbes, and lubrication, retaining top fitness each day. In comparison to the hand sanitizer, cleaning soap and water are extra efficacious in getting rid of positive microbes, pesticides, and other chemical residues that dawdle on hands. Hand sanitizers are extra high-quality in hospitals when hands are in contact with germs, however now not dirty or greasy. Other research additionally divulge that hand sanitizers may be effective on lubricated arms with positive microbes. When hands are closely dirty or greasy, for example, after playing out of doors games, gardening, fishing, travelling, executing extension things to do such as campaigning, and in certain cases, hand sanitizers might also now not be effective. In such circumstances, washing arms with cleaning soap and water is always preferable. Sanitizers can't eliminate soil, dirt, and lubrication as an alternative they will make fingers sticky, attracting more dirt. According to the Center for Disease Control (CDC), hand hygiene encompasses the cleaning of arms by means of the use of soap and water, antiseptic hand washes, antiseptic hand rubs such as alcohol-based hand sanitizers (ABHS), foams or gels, or surgical hand antiseptics. Hand sanitizers as disinfectants are in greater use nowadays due to the fact of its ease of availability, lack of water and time, and their verified efficacy in decreasing microbial load. A overview of lookup works states that confined literature is accessible in relation to hand sanitizers and washing hands. As COVID-19 has unexpectedly unfold worldwide, panic buying of sanitizers over the coronavirus pandemic has led to stocking up of sanitizer sprays, gels, and so on, besides knowing the impact of the sanitizer. The high goal of this study is to consider that washing hand with cleaning soap and water is extra efficacious and sensible than the usage of hand sanitizers in detaching positive micro-organisms.

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**Sanitizer:**

According to the World Health Organization (WHO), “an alcohol-containing preparation (liquid, gel, or foam) designed for software to the palms to inactivate microorganisms and/or quickly suppress their growth. Such preparations may also comprise one or greater kinds of alcohol, other lively components with excipients, and humectants. In 1966, hand sanitizers gothere into existence in healthcare facilities and was once popularized drastically in early 1990s.

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**Benefits:**

The blessings of hand sanitizers are that it is more convenient, portable, effortless to use and no longer time consuming. The households who observe the sanitizer have decrease risk of spreading gastrointestinal (stomach) and respiratory infection. Hand sanitizers which are commercially available contain substances which assist in stopping dryness of pores and skin. The frequency of absentees in school room can be reduced by way of 20percentage if hand sanitizers are used properly as it will no longer reason illness.

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**Pharmaceutical Ingredient and Their Function in Hand Sanitizer:**

ABHS consists of both ethanol, isopropanol, or n-propanol. A attention of 60%–95% of alcohol by using extent is stated to showcase highest quality bactericidal recreation [42,43]. The antimicrobial effect of alcohols is attributed to their potential to dissolve the lipid membranes and denature the proteins of microbes. Alcohols have broad-spectrum antimicrobial pastime towards most vegetative types of bacteria (including *Mycobacterium tuberculosis*), fungi, and enveloped viruses (human immunodeficiency virus [HIV] and herpes simplex virus). However, they are ineffective in opposition to bacterial spores that are found most normally in uncooked materials. The addition of hydrogen peroxide (3%) might also be a answer to this issue, however dealing with with warning throughout manufacturing is required due to its corrosive nature [41]. For alcohol-free products, more than a few antiseptics have substituted alcohol as the most important lively ingredient.

**Chlorhexidine :**

Similar to alcohol, chlorhexidine works through disrupting the association of cytoplasmic membranes, thereby main to precipitation of cellphone contents [44]. It is most wonderful in opposition to Gram-positive bacteria and has modest endeavor in opposition to a Gram-negative bacteria, as properly as enveloped viruses [44,45]. As chlorhexidine is cationic, it is beneficial to keep away from the use of chlorhexidine containing merchandisewith natural soaps and hand lotions that comprise anionic emulsifying retailers as they canalso reason inactivation or precipitation of chlorhexidine, accordingly lowering its efficacy [44–46]. Chlorhexidine gluconate 0.12% is likely to have antiviral exercise in opposition to the coronavirus as it does in opposition to different enveloped viruses [47].

**Chloroxylenol :**

Chloroxylenol is a frequent agent as a preservative in cosmetics or as an antimicrobial agent in soap. The antimicrobial impact of chloroxylenol is attributable to its capability to deactivate enzyme systems and alter telephone wall synthesis in microbes. It is exact at killing micro organism and enveloped viruses but much less energetic in opposition to *Pseudomonas aeruginosa* [48,49].

**Iodine/Iodophors :**

Iodine was once as soon as an high-quality antiseptic used for pores and skin disinfection. It can penetrate the microbial cell wall and structure complexes with amino acids or unsaturated fatty acids to impair the synthesis of mobile components. Nonetheless, due to its manageable to motive pores and skin inflammation and discoloration, iodophors have come into play to substitute iodine as the energetic ingredient in antiseptics. The FDA has not cleared any liquid chemical sterilant or high- level disinfectants with iodophors as the fundamental active ingredient [50]. Iodophors are a mixture of both iodine, iodide or triiodide, and a excessive molecular weight polymer service such as polyvinyl pyrrolidone. This provider is accountable for enhancing the solubility of iodine, improving the sustained launch of iodine, and minimizing pores and skin inflammation [51]. The diploma of antimicrobial pastime determined primarily based on the quantity of free iodine current in the structure. Having said so, formulations with decrease iodophor awareness can also have large antimicrobial pastime as well due to the fact the quantity of free iodine tends to amplify after dilution [52]. Both iodine and iodophors show

off germicidal undertaking towards a Gram-positive, Gram-negative, and spore-forming bacteria, as properly as a range of fungi and viruses [53–55]. However, the concentration of iodophors used in antiseptics (e.g., povidone-iodine 5%–10%) is generally inadequate to achieve sporicidal action. Furthermore, the nasal povidone-iodine formula has proven proper tolerability and favorable risk/benefit profile to assist mitigate the perioperative unfold of COVID-19 in patient decolonization [56].

#### **Quaternary Ammonium Compound :**

Quaternary ammonium compounds are composed of 4 alkyl corporations linked to a nitrogen atom in the centre. The usual examples consist of benzalkonium chloride, benzethonium chloride, and cetyl peridium chloride. They act by using adsorbing to the cytoplasmic membrane, therefore causing leakage of the constituents. They are greater energetic towards Gram-positive microorganism and lipophilic viruses. The endeavor towards fungi, mycobacteria, and Gram-negative bacilli is comparatively vulnerable [15].

#### **Triclosan :**

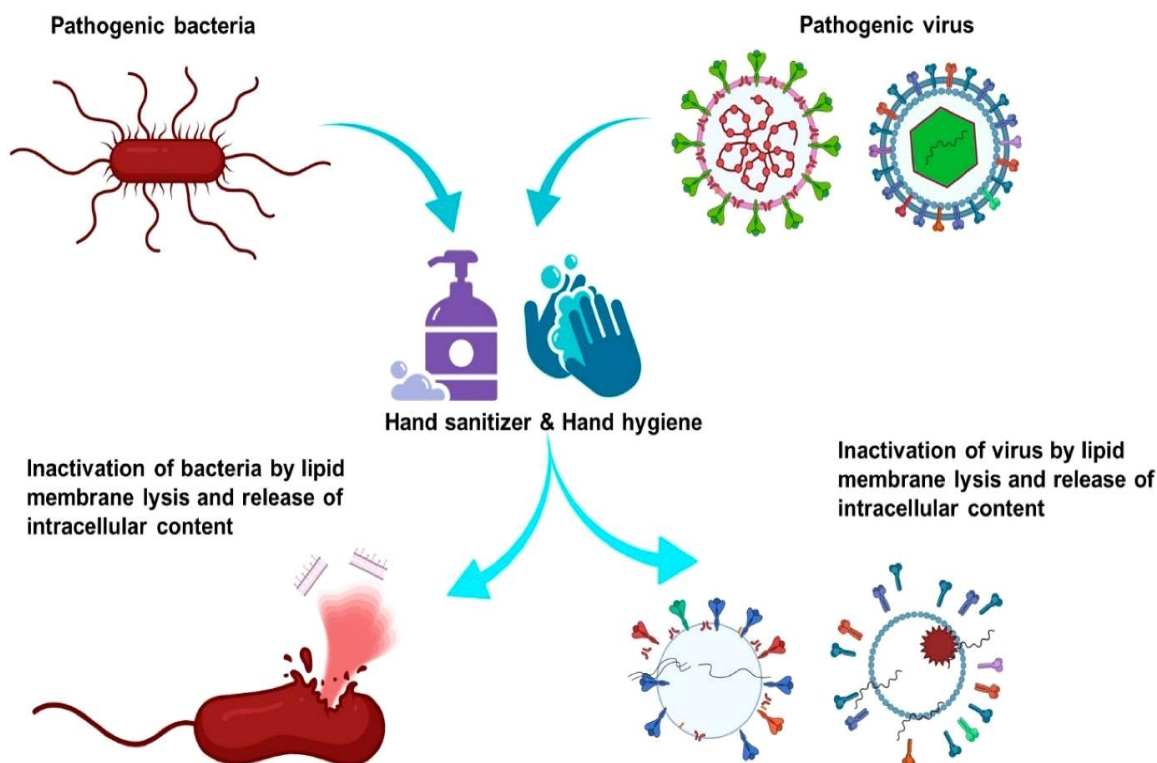
At low concentration, triclosan is bacteriostatic due to its unsafe results to bacterial enzymes responsible for the composition of fatty acid from cells wall and membranes. At excessive concentrations, triclosan disrupts the microorganism membrane, main it to dying [8,57,58]. It has excellent exercise against Gram-positive bacteria, along with methicillin-resistant *Staphylococcus aureus*, *Candida* spp. And mycobacteria. The efficacy of triclosan may also be affected by using pH, use of emollients, and the ionic nature of sure pores and skin formulations [58].

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#### **Action:**

#### **Adverse Effects of Alcohol-Based Sanitizer or Handwashing Soaps :**

The most normally said pores and skin reactions with the use of ABHS are irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD) [76,77]. The signs and symptoms of ICD can vary from slight to debilitating with manifestations like dryness, pruritus, erythema and bleeding, if severe. As for ACD, the signs and symptoms can both be slight and localized or extreme and generalized, with most extreme varieties of ACD being manifested as respiratory misery or different anaphylactic signs [78,79]. Sometimes, it may additionally be hard to distinguish between ICD and ACD due to the overlap and similarities of symptoms. Hand hygiene merchandise such as sanitizer and soaps can be unfavourable to the pores and skin thru several mechanisms: denaturation of the stratum corneum proteins, alteration of intercellular lipids, decrease in corneocyte concord and discount of stratum corneum water-binding potential [80,81]. The biggest concern is the depletion of the lipid barrier, in particular with repeated publicity to lipid-emulsifying detergents and lipid-dissolving alcohols as it may additionally penetrate deeper into the pores and skin layers and change the pores and skin flora, ensuing in extra well-known colonization by way of microorganism [82–84]. In order of decreasing frequency of ICD which includes handwashing soaps are iodophors, chlorhexidine, chloroxylenol, triclosan and alcohol-based products. Among the alcohol-based formulations, ethanol has the least skin-irritant property in contrast to n-propanol and isopropanol [21]. There are, however, different contributing factors that extend the hazard of ICDs such as lack of use of supplementary emollients, friction due to wearing and elimination of gloves and low relative humidity [85–87]. ABHS additionally has a drying impact on hands which can in addition motive the pores and skin to crack or peel [88–90]. On the different hand, ACD is prompted with the aid of allergic reactions in the direction of sure sellers in the formulations such as iodophors, chlorhexidine, triclosan, chloroxylenol and alcohols [91]. Individuals with allergic reactions to alcohol-based preparations may additionally have actual hypersensitive reaction to alcohol or hypersensitive reaction to impurity, aldehyde metabolite or different excipients like fragrances, benzyl alcohol, parabens or benzalkonium chloride [29,92,93].



**Fig.mechanism action of hand sanitizer against bacteria and virus.**

#### **ALCOHOL MECHANISM OF ACTION AGAINST BACTERIA :**

The compound, n-propanol, is the most oftentimes used alcohol compound in biocide sistant to ethanol alone.<sup>13,14</sup> Despite the viable synergy of ethanol and acidity, it remains known that most hand sanitizers proceed to be ineffective against nonenveloped viruses.<sup>s.7</sup> It is no longer recognized with a lot self assurance the exact mechanism of alcohol's antimicrobial activity, however, it may be associated membrane damage, and inhibition or uncoupling of mRNA and protein synthesis thru results on ribosomes and RNA polymerase,<sup>9</sup> or related with protein denaturation.<sup>7</sup> For activity against bacteria, its gold standard bactericidal efficacy is performed at concentrations between 60% and 90%.<sup>10</sup> In fact, absolute alcohol, or alcohol that is no greater than one percentage water, is much less bactericidal than alcohol between the aforementioned range.<sup>10</sup> Water is accordingly crucial in the protein denaturation process. No depend which process, if not multiple, are affected by using alcohol, necessary metabolic pathways, membrane injury and loss of mobile integrity subsequently occur.<sup>7</sup> It is important to note, however, that alcohols show off bactericidal activity against vegetative bacteria—those present process metabolism and binary fission—but no longer towards spores

#### **ALCOHOL MECHANISM OF ACTION AGAINST VIRUSES :**

The viral goals of alcohol-based hand sanitizers are predominantly the viral envelope, if present, which is derived from host lipid envelopes, the protein capsid, which includes and protects the genetic material, and the genetic fabric itself.<sup>7</sup> Given that all these components are fundamental for the viral existence cycle (eg. attachment, penetration biosynthesis, maturation, lysis), and as a result imperative for its ability to transmit to someother host, it can be presumed that altering the shape or characteristic of any of the aforementioned components will commonly render the virus ineffective. While much less is regarded related to the unique mechanism of motion of alcohols sellers in opposition to viruses compared to bacteria, it is understood that ethanols have a broader and better virucidal exercise than propanols. In fact, excessive attention of ethanol has proven to behighly nice towards enveloped viruses<sup>12</sup> and accordingly is effective against the majority of clinically applicable viruses.<sup>13</sup> It is additionally interesting to be aware that including acids to ethanol options can expand its efficacy in opposition to viruses that are greaterresistant to ethanol alone.

**Result and discussion:**

The learn about proven that, akpeteshie carries ethanol. The formulated Ethanol primarily based hand sanitizer (EBHS), 63.70% made from akpeteshie is high quality towards *V. cholerae*. The components guarantees to be relatively low cost to all people, mainly these of decrease economic status thinking about the relative low price of neighborhood gin and low price of preparation approach employed. High patronage and rational use of the formulated product need to as a result make a contribution to enervating the spread of cholera in Ghana and beyond. The findings from this learn about recommend the want for similarly lookup in optimising the use of nearby gin as a especially lower priced nearby uncooked material for the manufacture of different antiseptic cleansing retailers such as rubbing alcohols, hand scrubs and in the base instruction of antibacterial shower gels and wipes. Comparison of new formulations of hand sanitiser from nearby gin the use of various however greater concentrations of nearby gin can qbe done to determine on the most fulfilling attention with easiest efficacy against pathogens.

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