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SHORT PAPER

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Hidden threat lurking behind the alcohol sanitizers in COVID-19 outbreak

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Abstract

The ongoing COVID-19 pandemic has made various challenges for communications all over the world. Nowadays hand hygiene practices with alcohol sanitizers are an unavoidable reality for many people, which cause skin dryness and flaking. The current short communication has been explained about monitoring the quality control of alcohol concentrations and hand rub formulation, which needs more attention and should consider meticulous in this crisis.

KEYWORDS

alcohol concentrations, COVID-19, hand dermatitis

According to the available documents, the most important way to transmit diseases, especially in medical centers, is by hands and now we know that more than 80% of infections are transmitted by touch. As it has been documented, normal human skin is colonized by different kind of bacteria, with totally different aerobic counts (ranging from $>1 \times 10^6$ colony forming units [CFU]/cm^2 on the scalp to 1×10^4 CFU/cm^2 on the forearm), this is while total bacterial counts on the hands of a health person is ranged from 3.9×10^4 to 4.6×10^6 CFU/cm^2.[1] Along with this the hands of some health care workers may become persistently colonized by some pathogenic flora such as *Staphylococcus aureus*, Gram-negative bacilli, or some other kind of microorganisms.

In the recent pandemic, COVID-19, which is stands for "coronavirus disease 2019," is introduced as the cause of world acute respiratory infection crisis and outbreak.[2] In this context, public health guideline recommended by World Health Organization emphasized on frequent and correct washing hands with standard hand rubs to prevent transmission and reduce the spread of the mentioned pandemic diseases. Based on these protocols and recommendations, use of alcohol-based hand rubs has become very common around the world. Although it is true that hand hygiene is the most important way to break the infection chain transmission but using proper solution with the standard formula should be consider strongly. Although handwashing with water and soup is the most recommended procedure but due to lack of access in some situations, Ethanol-containing hand rubs are used frequently as a substitute for mentioned method. In the recent crisis due to the fact that the consumption of hand rub solutions has greatly increased in the world, several cases of related risks have been proposed, which are discussed in this article, so evaluation the alcohol concentrations should be considered in quality control procedures meticulous. Due to the fact that handwashing can be performed with different methods and compounds, so this instruction should be considered and assay both in terms of behavior and the risk of production formula. Governments and health policy makers should encourage local production but monitoring the hand rub formulations to have enough efficiency and safety.

Another problem about hand rubs is skin complications. Due to the excitement in the world and overuse, the alcohol-based hand rubs have caused adverse effects on the skin of many people who used it frequently. Figure 1 demonstrates a contact dermatitis in two cases and an exacerbation of atopic dermatitis on the palm. In a review study by Cristina Beiu et al, it has been mentioned that frequent handwashing for COVID-19 prevention can cause hand dermatitis.[2] Good hand hygiene helps prevent the transmission of infections such as COVID-19, but these preventive practices can also damage the skin. It has been proved that frequent hygenization of hands make several changes in texture of skin. These changes are ranged from development of cutaneous xerosis (dryness) up to irritant contact dermatitis (ICD) and rarely allergic contact dermatitis (ACD). These disorders are

FIGURE 1 Demonstrating a contact dermatitis in two cases and an exacerbation of atopic dermatitis on the palm

induced by different mechanisms such as physical, chemical, and immunological. Appearing hand dermatitis makes difficult situation to balance the dilemma of maintaining hand hygiene and preventing eczema flare. Based on these mechanisms, properties of hand hygiene policy, rub compounds (quality and formula), and used techniques are very important to be measured and must be considered based on the following circumstances:

1 One of the most popular hands hygiene techniques according to the recent pandemic crisis related to COVID-19 is the use of gloves. The remarkable thing about this is prolonged wearing medical gloves, which have some side effects such as increased sweating and humidity of the hands and in the following increases the inflammatory responses and irritants which will be followed by fungal and bacterial skin infections.
2 Repeated use of soaps, surfactants, detergents, or solvents due to their capacity to remove skin surface lipids, damage to skin proteins, denature epidermal keratin, and even induce alteration of the cell membrane of keratinocytes can lead to ICD and rarely to ACD.
3 Frequent use of alcohol-based products can result in skin dryness and irritation.
4 In addition to the above and due to the recent crisis related to COVID-19, there are some other points that should be considered during executing the instructions.

Since the outbreak of COVID-19, although washing with warm water and soap remains the gold standard for hand hygiene, but according to the structural characteristic of coronaviruses, (enveloped viruses with bilayer lipid) alcohol-based products introduced as the most effective hand sanitizers. In this crisis, and due to the high volume of alcohol consumption, a number of problems are emerging, which, if not controlled in a timely manner, could create other crises for the general health of society. One of the problems with alcoholic products is the production of hand rubs with nonstandard formulas. For example, it has been cleared that methanol is used instead of ethanol in some products. While methanol itself is not a type of toxin, but when adsorbed to the human body, it metabolized by dehydrogenase enzymes into formaldehyde and formic acid. These end products are toxic and may cause metabolic acidosis, brain injury, blindness, cardiovascular instability, and death.[3,4] Methanol toxication most frequently results via oral, industrial inhalation, and transdermal routes.

One of the dangers of widespread use of alcoholic solutions in society especially by ordinary people is eliminating many skin normal florae that are very important for the health system, and this is because those such compounds do not differentiate between foe and friend bacteria.[5]

Another important point about alcohol products is its production based on the nonstandard formula, especially situation-based protocols. In standard alcohol-based hand sanitizers, varying amounts (60%-80% most effective, higher, and less are not most effective) and types of alcohols are used. In these compounds, isopropyl alcohol, ethanol (ethyl alcohol), *n*-propanol, or a combination of two of these are used.[6] This group of sanitizers is found effective at killing many types of bacteria including Gram-positive and Gram-negative types and also different virus families including influenza A virus, rhinovirus, hepatitis A virus, HIV, and coronaviruses. However, they have virtually no activity against bacterial spores, protozoan oocysts, and very poor activity against non-enveloped (nonlipophilic) viruses.[7,8]

Although alcohols with the mentioned points are rapidly germicidal when applied, but have no significant residual activity and

regrowth of bacteria occurs after use of alcohol sanitizers. For this reason, some compounds such as chlorhexidine, quaternary ammonium compounds, octenidine, or triclosan are added to alcohol-based formulations to increase persistent activity of hand rubs. According to the recent crisis, Food and Drug Administration released a temporary compound producing guideline for certain alcohol-based hand sanitizer products during COVID-19 pandemic on March 14, 2020, as the public health emergency.[9] Based on such emergency instructions, produced antiseptics solutions have not proper effect and cannot cover all introduced pathogens especially all kinds of nosocomial infections. Although this single alcohol-based sanitizers with no persistent compounds may be effective on the infectious agent causing the 2020 crisis (SARS-CoV-2), according to its limited activity against certain groups of microorganisms, this will cause selection pressure on ethanol-resistant microorganisms. This clonal selection, especially in hospital settings, will lead us to emerge and re-emerge of some controlled microorganisms that will cause a new crisis.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

AUTHOR CONTRIBUTION

All authors drafted part of the manuscript and approved the final version.

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