



THE SANITIZERS WITH SPECIAL REFERENCE TO COVID-19-A REVIEW

RAVI^{1*} AND AWASTHI HH²

1: Ph.D. Scholar, Department of Rachna Sharir, Faculty of Ayurveda, I.M.S B.H.U, Varanasi-221005, U.P.

2: Professor & Former HOD, Department of Rachna Sharir, IMS, BHU, Varanasi-221005, U.P.

***Corresponding Author: Mr. Ravi: E Mail: ravi.pharmacon@gmail.com, Mobile: +919532456800**

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ABSTRACT

Due to the pandemic novel virus, SARS-CoV2, many unpredicted challenges faced to the public health around the whole world. Presently, preventive and supportive measures are taken to deal with COVID-19 which is aimed at minimizing the transmission. Hand hygiene is one of the most simple and effective method to reduce the transmission but unfortunately there is very less is known regarding the efficacy of hand sanitizers against SARS-CoV2. This review is focused on the enlightening the efficacy and use of sanitizers. After reviewing a number of literatures, we have tried to summarize the primary active ingredients and mechanism of action of hand sanitizers, along with this we have tried to compare the effectiveness and compliance of gel and foam sanitizers and try to predict whether alcohol based or non-alcohol based sanitizer effective against SARS-CoV-2.

Keywords: SARS-CoV-2, COVID-19, sanitizer, foam, gel

INTRODUCTION

The existence of novel pathogens either bacterial or viral always leads to serious challenges to public health around the world. Among all one of the dangerous pathogen is

“severe acute respiratory syndrome coronavirus 2” or SARS-CoV-2, more commonly known as coronavirus disease 2019 or COVID-19, which has been declared

a global epidemic by the World Health Organization in early 2020. Since it was introduced in December 2019 in Wuhan, there have been over three million confirmed cases throughout the worldwide by April 2020 [1]. Along With cases increasing exponentially throughout the world, it has caused significant burden on all aspects of society due to aggressive isolation i.e social distancing methods to prevent the spread of the virus. In the present duration of time, therapeutic application methods to deal with COVID-19 are only supportive; prevention is aimed and focused at reducing transmission is the best method at current time period. Along with this, one of the many ways implemented to prevent the spread of Covid-19 virus along with previous contagious pathogens, is frequent and effective hand washing. In healthcare and community sectors, alcohol- based hand sanitizers have become a very popular alternative to the traditional hand washing with soap and water. In the current pandemic situation Alcohol-based hand sanitizers is utilized as an effective alternative in comparison to hand washing to prevent the spread of bacterial and viral infections like Covid-19, this is very important to making it one of the very essential protocols in decreasing healthcare burden at this time when we are

having no alternative [2-3]. A several range of hand sanitizers are available with various combinations of ingredients and modes of delivery which are effective for the prevention against Covid-19 virus. Along with giving the popularity of hand sanitizers during this pandemic, it is important to understand which types of hand sanitizers are more potent against this novel Corona virus. In this review, we will discuss the role of various types of alcohol-based hand sanitizers are therapeutically effective in elimination of bacterial and viral pathogens with the focus on the effectiveness against enveloped viruses,

Like as SARS-CoV-2.

Hand Sanitizer Ingredients:

There are basically 2 large categories of hand sanitizers:

(1) Non-Alcohol based hand sanitizers (NABHS) and

(2) Alcohol-based hand sanitizers (ABHS).

(1) Non-Alcohol based hand sanitizers (NABHS):

The most common principal potent ingredient of NABHS are benzalkonium chloride, quaternary ammonium, commonly used as disinfectant [4]. Disinfectants comprises with benzalkonium chloride are generally less irritating than the sanitizers contains alcohol, but generally in the current

research results that, excessive use may cause contact dermatitis [5].

(2) Alcohol-based hand sanitizers (ABHS):

In comparison to NABHS, ABHS are less compatible to skin, ABHS dominated in health care units due to their low cost and efficacy and potency of reducing infectious transmission [6].

Hand sanitizer preparations containing alcohol along with this, can include ethanol, isopropyl alcohol, n-propanol in combination with water, as well as excipients and humectants [7]. Solutions containing alcohols between 60% and 95% in volume are most potent and effective. Humectants are included to prevent skin dehydration, helps to retain the moisture and rest of excipients help stabilize the product as well as prolong the time needed for the evaporation of alcohol, along with this, increases the contact time, which results in increasing their biocidal activity [8].

Mechanism of action of alcohol against Virus:

The alcohol-based hand sanitizers targets the viral envelope, if present, which is derived from host lipid envelopes, the protein capsid, which contains and protects the genetic material, and the genetic material itself. Given that all these components are necessary for the viral life cycle (eg,

attachment, penetration, biosynthesis, maturation, lysis), and thus it is not possible for virus to transmit its genetic material to another host, it can be presumed that altering the structure or function of any of the aforementioned components will typically render the virus ineffective.

There is less research work is done regarding the specific mechanism of action of alcohols agents against viruses compared to bacteria, but it is understood that ethanols have a broader and stronger virucidal activity as compared to propanols. It is true that high concentration of ethanol are highly effective against enveloped viruses [9] and thus is effective against the number of clinically relevant viruses [10]. It is also reported that after adding acids with ethanol solutions can increase potency of sanitizers against viruses that are more resistant in comparison to ethanol alone [11]. Despite the potential synergy of ethanol and acidity, it also noted that most hand sanitizers continue to be ineffective against nonenveloped viruses [12].

Efficacy of Hand Sanitizer:

Hand sanitizer have efficacy against almost all microorganisms, this is the reason sanitizers are more potent in comparison to any other method of sanitization.

Viruses:

It is very hard task to directly study viruses in vivo as compared to bacteria, a number of studies have done to validate the efficacy of hand sanitizers on viruses. In this duration of pandemic, World Health Organization recommended alcohol-based hand sanitizer formulations against different sever diseases like bovine viral diarrhea virus, hepatitis C virus, Zika virus, murine norovirus, and corona viruses as proved with effective deactivation in quantitative suspension tests [13]. There are a number of studies in which other formulations that contain isopropanol as the key ingredient also completely ineffective enveloped enteric and respiratory viruses, such as H1N1 influenza A virus [14], but also failed to inactivate nonenveloped viruses, except rotavirus. Fingertips were contaminated with viruses and after the application of sanitizer the virus count reduced to almost nil, A number of in vivo studies had supported this statement [15]. A number of evaluation have been done one of them is finger pad tests, which shows moderate efficacy against most nonenveloped viral strains, which are known to be more resistant to disinfectants than enveloped viruses [16]. It is very important to note that the type of viral strains which contains high concentrations of ethanol are highly effective against enveloped viruses

and thus, it is the reason that sanitizers are effective against the majority of clinically relevant viruses [13]. It is being observed that nonenveloped viruses such as Hepatitis A and enteroviruses needs 70%-80% alcohol to be completely inactivated, Researcher had suggested that 60% ethanol was sufficient to reduce the titers of rotavirus, adenovirus, and rhinovirus by $>3 \log_{10}$ within a 10-second contact period [17]. Nonenveloped viruses can also be completely destroyed, by using higher alcohol concentrations and extended contact times [18, 19].

Comparison between Foam sanitizer and Gel sanitizer:

There is basically three ways of delivering active constituent in hand sanitizers i.e. foam, gel and sprays. There is less literature available which compare the efficacy of hand sanitizers or to determine the best delivery system against virucidal action. In one study, the researcher have found that over the trial on 30 volunteers, all three form of hand sanitizers (foam, Gel and wipes) were applied, there was no significant difference in the efficacy of different delivery types. But rather there is need of further detailed research is needed to clarify the results [20]. Along with this, the formulation of hand sanitizer plays an important role in giving virucidal effect but there is conflict in the

results exist. Some of the manufacturers suggest that volume of sanitizers to be applied could affect that virucidal efficacy [21, 22]. It was found that the volume <2ml leads to higher rate of poor coverage and volume >2ml leads to lower rate of incomplete coverage. However, WHO guide lines says the amount should be taken “cover all surfaces of the hand” [23]. It was also reported that health care workers use inadequate volume of sanitizer due to rapid drying time, this leads to incomplete hand coverage. This is the reason that nurses reject high volume of sanitizer in gel, foam or liquid [24, 25].

CONCLUSION

According to the current research and available literature, the results are more than enough in the favor of Alcohol Based Hand Sanitizer (ABHS), but it difficult to suggest one mode of hand sanitizing over the other. In the absence of water ABHS are the most efficient method of sanitizing. Along with these discussions it is important to note that ABHS are efficient to deactivate similar structure SARS-CoV-2. Further more studies are required to explore the results.

REFERENCE

- [1] Coronavirus disease 2019 (COVID-19) Situation Report-101. 2020. <https://www.who.int/docs/default->

source/coronaviruse/situation-reports/ Accessed July 10, 2020.

- [2] Pittet D, Allegranzi B, Boyce J. The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. *Infect Control Hosp Epidemiol.* 2009; 30: 611–622.
- [3] Boyce JM, Pittet D, Healthcare Infection Control Practices Advisory Committee. Society for Healthcare Epidemiology of America. Association for Professionals in Infection Control. Infectious Diseases Society of America. *Infect Control Hosp Epidemiol.* 2002; 23(12 Suppl): S3–40.
- [4] Gold NA, Avva U. Alcohol Sanitizer. StatPearls Publishing; 2018. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/30020626>. Accessed July 10, 2020.
- [5] Wentworth AB, Yiannias JA, Davis MDP, Killian JM. Benzalkonium chloride: a known irritant and novel allergen. *Dermatitis.* 2016; 27: 14–20.
- [6] Fleur P la, Jones S. Non-alcohol based hand rubs: a review of clinical effectiveness and guidelines [Internet]. CADTH Rapid Response Report. 2017. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/29266912>. Accessed July 10, 2020.

- [7] Mcdonnell G, Russell AD. Antiseptics and disinfectants: activity, action, and resistance. *Clin Microbiol Rev.* 1999; 12: 147–179. American Society for Microbiology (ASM).
- [8] Bush LW, Benson LM, White JH. Pig skin as test substrate for evaluating topical antimicrobial activity. *J Clin. Microbiol.* 1986; 24: 343–348.
- [9] Kampf G, Kramer A. Epidemiologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs. *Clin Microbiol Rev.* 2004; 17: 863– 893. American Society for Microbiology (ASM).
- [10] Kampf G. Efficacy of ethanol against viruses in hand disinfection. *J Hosp Infect.* 2018; 98: 331–338.
- [11] Park GW, Barclay L, MacInga D, Charbonneau D, Pettigrew CA, Vinje J. Comparative efficacy of seven hand sanitizers against murine norovirus, feline calicivirus, and GII.4 norovirus. *J Food Prot.* 2010; 73: 2232–2238.
- [12] Dastider D, Jyoti Sen D, Kumar Mandal S, Bose S, Ray S, Mahanti B. Hand sanitizers bid farewell to germs on surface area of hands. *Eur J Pharm Med Res.* 2020; 7: 648– 656.
- [13] Siddharta A, Pfaender S, Vielle NJ, et al. Virucidal activity of World Health Organization-recommended formulations against enveloped viruses, including Zika, Ebola, and emerging corona viruses. *Br Rep J Infect Dis.* 2017; 902: 902– 908.
- [14] Steinmann J, Becker B, Bischoff B, et al. Virucidal activity of 2 alcohol-based formulations Proposed as hand rubs by the World Health Organization. *Am J Infect Control.* 2010; 38: 66–68.
- [15] Tuladhar E, Hazeleger WC, Koopmans M, Zwietering MH, Duizer E, Beumer RR. Reducing viral contamination from finger pads: handwashing is more effective than alcohol-based hand disinfectants. *J Hosp Infect.* 2015; 90: 226–234.
- [16] Ansari SA, Sattar SA, Springthorpe VS, Wells GA, Tostowaryk W. In vivo protocol for testing efficacy of hand-washing agents against viruses and bacteria: experiments with rotavirus and Escherichia coli. *Appl Environ Microbiol.* 1989; 55: 3113– 3118.
- [17] Sattar SA, Abebe M, Bueti AJ, Jampani H, Newman J, Hua S. Activity of an alcohol based hand gel against human adeno-, rhino-, and rotaviruses using the finger pad method. *Infect Control Hosp Epidemiol.* 2000; 21: 516–519.
- [18] Kampf G, Grotheer D, Steinmann J. Efficacy of three ethanol-based hand

- rubs against feline calicivirus, a surrogate virus for norovirus. *J Hosp Infect.* 2005; 60: 144–149.
- [19] Kampf G, Rudolf M, Labadie JC, Barrett SP. Spectrum of antimicrobial activity and user acceptability of the hand disinfectant agent Sterillium Gel. *J Hosp Infect.* 2002; 52: 141–147.
- [20] Larson E.L., Cohen B., Analysis of alcohol based hand sanitizer delivery systems; efficacy of foam, gel and wipes against influenza A (H1N1) virus on hands, *Am. J. Infect Control*, 2012; 40; 806-809.
- [21] Grayson M.I., Melavin S, Efficacy of soap and water and alcohol-based hand-rub preparations against live H1N1 influenza virus on the hands of human volunteers. *Clin Infect Dis.* 2009; 48; 285-291.
- [22] Kamp G, Ruselack S., Less and less influence of volume on hand coverage and bacterial efficacy in hand disinfection, *BMC Infect Dis.* 2013; 13; 472.
- [23] Lens C, Jerome L., A scientific study that proves alcohol and sanitizers is more effacious when dispensed onto the hands as foam rather than as gel. *Can J Infect Control*, 2011; 26; 21-25.
- [24] Kamp G, Marschall S, Efficacy of hand based foams using clinically relevant amounts: a cross over controlled study among healthy volunteers, *BMC Infect Dis.* 2010; 10; 78.
- [25] Greenaway RE, Ormandy K, Impact of hand sanitizer format (gel/foam/liquid) and dose amount on its sensory properties and acceptability for improving hand hygiene compliance. *J Hosp Infect*, 2018; 100: 195-201.