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Review on Efficacy of Aloe Vera as a Disinfectant (Hand Sanitizer)

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Abstract: *The need to use a natural alternative for disinfecting dental impression materials, which should be biocompatible and effective, led us to evaluate the efficacy of Aloe vera as a disinfectant by immersion and spray method on alginate impression material and its effect on the dimensional stability of the resultant gypsum cast. The aim of the research was to extract of Aloe vera contains active compounds such as alkaloids, phenols, flavonoids and saponins and produce hand sanitizer by Aloe vera extract. Many hand sanitizers use harsh chemicals and synthetic ingredients to eradicate germs. However, these may dry or even damage your skin. Aloe Vera is a wholesome ingredient with antioxidant and moisturizing properties. Hand sanitizer with Aloe Vera soothes skin while it cleanses. The efficacy of a chemical used for sanitizing or disinfection rests upon its ability to reduce the contamination level. .*

Keywords: Aloe vera, Cast, Dimensional Stability, Disinfectant, Irreversible Hydrocolloid

I. INTRODUCTION

Irreversible hydrocolloid or alginate is the most used impression material in dentistry since it is easy to manipulate, does not imply specialized equipment, and is low-priced. Alginate is based on natural substances extracted from brown seaweed. As irreversible hydrocolloids are composed of 80% water, they are subject to the phenomena of imbibition and syneresis. The patient's saliva, dental plaque, and blood are a potential source of contamination for impression materials that can be a health hazard and have detrimental effects on the outcome. The control of cross-infection and lack of its standard procedures are crucial topics while dealing with dental impression materials. Irreversible hydrocolloid being partly organic, hydrophilic, irregular, and porous, ensures the retention and growth of microorganisms.

The main advantage of the use of aloe vera as a disinfectant is that it is a natural product that has no or minimal side effects, readily available, and, most importantly, is 100 percent biodegradable and does not cause any harm to the environment. Disinfectants in routine use (sodium hypochlorite, glutaraldehyde) can have several deleterious effects like burning sensation of mouth and throat, irritation of eyes and skin, watering of eyes, and others. The disinfection only removes microorganisms from the surface of the impression, but an unwanted side-effect of this process is the potential for a change in the dimensions of the impression due to interaction between the set material and the disinfecting solution. Aloe vera has been used for ages for medicinal purposes and can be used fruitfully in the field of dentistry as well. The main advantage of the use of aloe vera as a disinfectant is that it is a natural product that has no or minimal side effects, readily available, less expensive, and, most importantly, is 100 percent biodegradable and does not cause any harm to the environment.

Hand washing is as essential as eating food. It is the best way to be healthy and to stay away from various diseases. Soap plays an important role in removing dust, microbes, and lubrication, maintaining good health every day. In comparison to the hand sanitizer, soap and water are more efficacious in removing certain microbes, pesticides, and other chemical residues that dawdle on hands.1

Hand sanitizers are more effective in hospitals when hands are in contact with germs, but not soiled or greasy. Other studies also reveal that hand sanitizers might be effective on lubricated hands with certain microbes. When hands are heavily soiled or greasy, for example, after playing outdoor games, gardening, fishing, travelling, executing extension activities such as campaigning, and in certain cases, hand sanitizers may not be effective. In such circumstances, washing hands with soap and water is always preferable. Sanitizers cannot remove soil, dirt, and lubrication rather they will make hands sticky, attracting more dirt.2,3

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According to the Center for Disease Control (CDC), hand hygiene encompasses the cleansing of hands by using soap and water, antiseptic hand washes, antiseptic hand rubs such as alcoholbased hand sanitizers (ABHS), foams or gels, or surgical hand antisepsis. Hand sanitizers as a disinfectant are in more use today because of its ease of availability, lack of water and time, and their proven efficacy in lowering microbial load.3

What Is a Sanitizer?

According to the World Health Organization (WHO), "an alcohol-containing preparation (liquid, gel, or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth. Such preparations may contain one or more types of alcohol, other active ingredients with excipients, and humectants."3 In 1966, hand sanitizers came into existence in healthcare facilities and was popularized significantly in early 1990s.4

Types of Hand Sanitizers

Hand sanitizers can be classified as alcohol-based or alcohol-free. Alcohol-based sanitizers comprise between 60 and 95 percent alcohol in the form of ethanol, isopropanol, or npropanol. Alcohol have tendency to disseminate proteins and counteract certain microorganisms at this concentration. Alcohol-free products have a property of disinfectants, such as benzalkonium chloride (BAC), or on antimicrobial agents, such as triclosan, which is immediate and purposeful. Several sanitizers comprise emollients (e.g., glycerin) that pacify the skin, thickening agents, and provides aroma.

Benefits:

- The advantages of hand sanitizers are that it is more convenient, portable, easy to use and not time consuming.
- The families who apply the sanitizer have lower risk of spreading gastrointestinal (stomach) and respiratory infection.
- Hand sanitizers which are commercially available contain ingredients which help in preventing dryness of skin.
- The frequency of absentees in classroom can be reduced by 20 percent if hand sanitizers are used properly as it will not cause illness.

Effectiveness

Hand sanitizers are more effective when used in appropriate amount. Proper use, duration of exposure, and frequency of use also play an important role in relatable effectiveness of the hand sanitizer. For the outcome of sanitizers, the presence of the infectious agent on the host should be susceptible to the active ingredient present in the product. Alcohol-based waterless sanitizers should be rubbed thoroughly for 30 seconds, which followed by complete air-drying can reduce various micro-organisms. Even alcohol-free formulations, such as the SAB
(surfactant, allantoin, and BAC) hand sanitizer, show its effect when used properly. Some study also reveal that many hand sanitizers are ineffective against bacterial spores, enveloped viruses (e.g., norovirus), and encysted parasites (e.g., Giardia). Hand sanitizers are not effective when hands are noticeably soiled, lubricated, and greasy prior to application.
As there is inconsistency in the effectiveness, hand sanitizers can be recommended to control the transmission of infectious diseases, where accessibility to soap and water is difficult.
The efficacy of the hand sanitizer is dependent upon the proper technique, the quantity of the sanitizer used, the ingredient, and its consistency of use. In various circumstances, such as using it on soiled or greasy hands and heavy loading of microbes, a reduction in the effectiveness of the sanitizer is reported.1 The increment in the purchase of hand gels is not just dependent upon the fear of pandemics, but the sale in the market has been driven in pretty, child-friendly colors and with wellness-friendly fragrance such as lemon and orange flavors, that are far acceptable than the pungent-smelling waterless sanitizers found in hospitals.

Materials and Methods:

Aloe vera, glycerin, vitamin , clove oil, lavender oil, and tea tree oil , and three commercially available hand sanitizer gels with over 60% alcohol content.
Preparation of hand sanitizer:

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Sr no.	Ingredients	Quantity	Role or uses
1	Essential oil (Lavender oil)	2.5% v/v	Antibacterial agent
2	Aloevera gel	90%v/v	Skin moisturizer
3	Glycerine	5%v/v	Emilient
4	Vitamin E	0.05%v/v	Nourishment agent
5	Distilled water	qs	Vehicle

Several natural materials were used to prepare the hand sanitizer gels in pertinent proportions, including aloe vera glycerin, and vitamin E, in addition to Eos. Each formulation was prepared by dispersing gel (5% v/v) to aloe vera gel (90% v/v) in a 250 mL beaker and mixed with gentle stirring at ambient temperature.

Eos (at 2.5% v/v or 1.25% v/v) were then added dropwise with constant stirring to avoid air bubble formation and to obtain uniform and homogenous gels, followed by adding vitamin E (0.05 % v/v). The remainder of each formula was completed by distilled water. Control formulation was prepared using the same components of the prepared hand sanitizer gels, but with no addition of Eos. Table 1 shows the composition of all prepared hand sanitizer gels and the control gel with each ingredient's concentration.

Evaluation Parameters:

Organoleptic Test The prepared samples were inspected visually to check the texture, odor, and color of the gels in semisolid conditions.

PH Evaluation The pH measurement of the formulated gels was measured using a digital pH meter (Mettler Toledo pH meter, USA). The pH measurements represent the mean ± standard deviation (SD) of three replicates.

Viscosity (Rheological Properties) The rheological and flowability properties of the prepared gels were determined at room temperature using a TCV 300 viscometer .A piston of a range of 1–10 cP was used, as the formulations had a texture equivalent to water, and the temperature was set to room temperature (≈24 °C). One mL from each prepared hand sanitizer was filled into the measurement chamber. The chamber was capped for 60 s until it was stable, and then the data were recorded. The results represent the mean ± SD of three replicates.

Gel Spreadability The spreadability of the prepared hand sanitizers was evaluated according to the methodology described in [18]; 0.5 gm of each formulated gel was spread on pre-marked transparent glass with a 2 cm diameter. Then, another transparent glass was placed on the top, followed by adding a 500 gm weight for 5 min to disperse the content. By this method, the spreadability was measured based on slip and drag characteristics of the gels. An excess of the gel was scrapped off from the edges.

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Antimicrobial Zone of Inhibition Test To evaluate the antimicrobial activity of the prepared hand sanitizer gels, the zone of inhibition test against different gram-positive and gram-negative bacterial strains and a yeast was performed. Three commercially available hand sanitizers were also assessed as experimental controls. A final concentration of 1 × 106 CFU/mL inoculum was equally distributed on the surface of agar plates. A sterile microbiological disc was dipped into each hand sanitizer gel, allowed to dry for a few seconds, and then positioned on the Mueller– Hinton agar plate. All plates were incubated overnight at 37 °C. The diameter of the clear area of no growth around each disc was recorded in millimeters (mm). The results represent the mean ± SD of three replicates.

Skin Irritation Study (Acceptability Test) Based on the results of the previous antimicrobial effectiveness test, the most efficient gel formulation was selected to be tested in a skin irritation study. The study was carried out on 20 volunteers and ethically approved by the research ethics committee in King Abdulaziz City for Science and Technology (KACST) (IRB approval number; IRB#20007). After explaining the research protocol with possible side effects, the volunteers were asked to sign consent forms. The assessment was performed by applying 1 mL of sanitizer gel on each volunteer's palm, then allowed to stand for 5 min.

II. CONCLUSION

Hand sanitizer gel is one of the alternative options for hand hygiene. Due to the emergence of the COVID-19 pandemic, the prevention and control of bacterial or fungal co-infections using AFHS gels can be crucial, particularly when the alcohol supply chain is at risk. In this study, AFHS gels were formulated using aloe vera, glycerin, vitamin E, and several Eos as the active antimicrobial ingredients. It is concluded from the results that the prepared formulations have excellent organoleptic properties, pH values comparable to skin pH, and suitable viscosity and spreadability profiles. The antimicrobial test showed varying activities of different EO-based formulations against several gram-positive and gram-negative bacteria and Candida. Finally, the stability test for the hand sanitizer formulations should also be evaluated to ensure the shelf-life of this EO-based hand sanitizer.

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