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"Formulation, Optimization and Evaluation Microbiologically of Ethanol 64% v/v Gel"

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Abstract
The purpose of this work was to formulate antiseptic ethanol 64% v/v gel. A number of trials were done in order to prepare a good hygienic gel using triethanolamine as gelling enhancer and glycerin as emollient. Different formulae were prepared using different percentages of carbomer. The formula (F 5) showed acceptable physical properties with good ability to spread on hands. The selected formula was subjected to microbiological evaluation. Results of microbiological evaluation proved that the gel formula F5 could decrease the microbiological count on hands.

Keywords: Ethanol, Hand hygiene, antiseptic gel

Introduction
Skin hygienic products, especially of hands, is considered to be one of the primary mechanisms to decrease risk of transfer of infectious agents by both the contact and fecal-oral routes. But depending on the product used, washing can raise the pH of the skin. Long-term changes in skin pH can cause skin damage, increased skin shedding, since some of the antibacterial characteristics of the skin are associated with its normally acidic pH about 6. With prolonged soap contact, skin pH may reach 7.0–8.5 and remain high for 3–4 h. Soaps and detergents, particularly those that are anionic or cationic may, damage the skin when applied [1] Besides washing defeats the skin and the rate of lipid replenishment on the dorsum of the hands is only 20% after 1 h and 50% after 3 h. But fatty acids also have fungicidal and bactericidal activity important in modulating the skin flora [1] It is important to recall that hand disinfection is significantly more efficient than standard hand washing with soap and water. According to the area of application, strategies for the prevention of the transfer of microbial skin flora from the hands must consider the different categories of flora: transient, resident or infection flora. In contrast, resident skin flora are usually regarded as pathogenic only under certain circumstances such as in surgery. In the non-surgical field, only the transient and infecting flora from the hands play a role [2]. Hands already contaminated may be rendered safe by the procedures for the elimination of transients such as hand washing, hygienic hand wash. Among all usable chemicals, ethanol, isopropanol and n-propanol (in the order of increasing efficacy) are the strongest and fasten agents. Most common used concentrations are: ethanol (60–90%), isopropanol (70–80%) and n-propanol (60–70%). The duration of treatment (between 30 and 60 s) significantly influences the achievable reduction of microbial release.

There exists a strong positive correlation of the declining of microbial release and the hand treatment, between 1 to 5 min. Alcohol formulation gives perfect spreading quality and quick evaporation Alcoholic preparations are at least as tolerable for the skin as antiseptic detergents if they contain appropriate emollients [3] Other most popular active ingredients in hand disinfectants are: povidone-iodine, chlorhexidine gluconate and triclosan. But all of them are some specific negative characteristics compare to alcohol hand disinfectants. The crucial importance is the antimicrobial efficacy of hand disinfectants which are regulated by European Norms. A suspension test for the demonstration of bactericidal activity is obligatory for hand disinfectants in all fields of application, but test to prove activity against yeasts applies only to hygienic hand rub. [4] The purpose of work is to create the new hand disinfectant based on ethanol which is safe for environment.

Materials and Methods
Materials
Glycerin, agar and ethanol were gifted by Al-Zahrawi University College. Trietanolamine was purchased from a chemical store. High purity water was supplied by a purification system.

Methodology
Ethanol 64% gel preparation
A small amount of 0.1 N sodium hydroxide or triethanolamine was added to least amount of water or water and glycerin mixture about (30 ml) to bring the pH to (7-7.5), mixed well. Different percentages of carbomer were added with stirring with a glass rod till formation of a gel. Ethanol 64 ml was added gradually with stirring till the formation of clear gel. Volume was completed to 100 ml with water. Formulae are shown in Table (1).

Table 1: Formulae of the ethanol 64% v/v gel (64 ml per 100 ml)

Formulae	Ethanol (ml)	Sodium hydroxide	Glycerin (g)	Triethanolamine	Carbomer (g)
F 1	64	q. s.	----------	----------	0.1
F 2	64	q. s.	----------	----------	0.2
F 3	64	q. s.	10	----------	0.3
F 4	64	----------	10	q. s.	0.4

F 5	64	----------	10	q. s.	0.5
F 6	64	----------	10	q. s.	0.6
F7	64	----------	10	q. s.	0.7
F 8	64	----------	10	q. s.	0.8
F 9	64	----------	10	q. s.	0.9
F 10	64	----------	10	q. s.	1

*Deionized water was added to complete the volume up to 100 ml.

Evaluation of gel by microbiological method

Microbiological Sampling and processing to evaluate the hand gel

5 participants were asked to follow the same technique. The nutrient agar plate was placed on a steady surface. Participants were asked to put all 4 fingertips, excluding the thumb, in a nearly horizontal angle for 2 s onto the agar plate. This was followed by placing the thumb onto the same side of the plate as in the remaining space in the center of the plate. The fingertips of the other hand were put onto the opposite half of the plate in the same way. The previous procedures were made before and after rubbing the hand with the hand gel. The procedure was shown in Fig. 1.

Fig 1: fingerprint of a participant on agar plate

Each agar plate was transported from the field. In the laboratory the plates were placed in the incubator at 37 °C for 24 h. Number of viable bacteria were determined for the 10 plates by counting colonies on the agar plates.

Results and discussion

The prepared formulae F1-F3 with sodium hydroxide showed gel formation when left covered 3 days and was very irritant when applied on hands on contrary to the prepared formulae F4-F10 prepared with triethanolamine which were non irritant and gel formation of F4 to F10 was instant.

F5 was a good formula due to its easy application while F6-F10 were more viscous when applied on hands. So, F5 was selected to be subjected to microbiological evaluation The total viable count was less and smaller after rubbing the hand with hand gel. The results were shown in Fig. 2

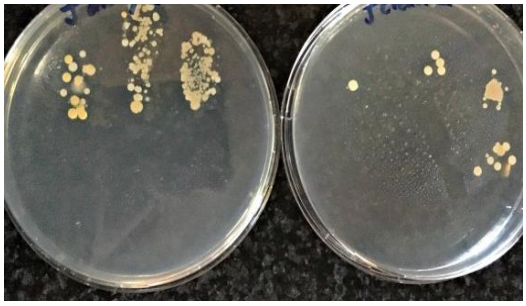

Fig 2: The colonies before usage (left) and after (right)

Table 2: Physical properties of prepared gel formulae

	pH	irritation	viscosity
F1	7.7	irritant	Good
F 2	7.5	irritant	Good
F3	7.5	irritant	Good
F4	7.6	Non irritant	moderate
F5	7.5	Non irritant	Very Good
F6	7.5	Non irritant	viscous
F7	7.6	Non irritant	Viscous
F8	7.5	Non irritant	Viscous
F9	7.6	Non irritant	Very viscous
F10	7.5	Non irritant	Very viscous

Table 3: Physical properties of selected gel

	Parameter	Result
1	Appearance	Clear gel
2	pH (7-8)	7.5
3	Color	Pink
4	Odour	characteristic

Conclusions

This study showed the formulae F5 which was prepared with triethanolamine, glycerin 10% w/w, carbomer 0.5% w/v was the best formula regarding viscosity, irritation and proved microbiologically to reduce the bacterial count on hands.

Authors contribution

All authors contribute equally all over the work

Conflicts of Interest

The authors declared no conflict of interest.

Acknowledgement

The authors declared non.

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