PROJECT WORK

FORMULATION OF COLOURED HAND SANITIZER

IN

B. PHARMACY

SEMESTER-VIII

By

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Declaration

I hereby declare that thesis entitled “FORMULATION OF COLOURED HAND SANITIZER” is a bonafide and genuine carried out by me. The results or observational data presented in this report are original.

Date:06/11/2020

Place: Rajkot

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Acknowledgement

This project provides an introduction to hand sanitizer, its formulation and ingredients profile, presenting an overview of hand sanitizer formulation and its effect that emphasizes the interplay between science, society, and individuals.

I am thankful to our HOD DR. Dhara Chavda, my guide Assistant professor Mr. Vijay Vekariya and whole staff members for their support during my project work.

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CERTIFICATE

This is to certify that project work embodied in this project entitled "FORMULATION OF COLOURED HAND SANITIZER" was carried out by Mr. Vashram Gamara (Enrolment no.) 172500290013 at Shree H.N. Shukla Institute of Pharmaceutical Education and Research for partial fulfilment of Pharm degree to be awarded by Gujarat Technological University. This project work has been carried out under my supervision and is to the satisfaction of department.

Date:

Place: Rajkot

Principal

Guide

Mr. Vijay Vekariya

Seal of Institute

INTRODUCTION:

Hand hygiene is of utmost importance as it may be contaminated easily from direct contact with airborne microorganism droplets from coughs and sneezes. Particularly in situations like pandemic outbreak, it is crucial to interrupt the transmission chain of the virus by the practice of proper hand sanitization. It can be achieved with contact isolation and strict infection control tool like maintaining good hand hygiene in hospital settings and in public. The success of the hand sanitization solely depends on the use of effective hand disinfecting agents formulated in various types and forms such as antimicrobial soaps, water-based or alcohol-based hand sanitizer, with the latter being widely used in hospital settings. To date, most of the effective hand sanitizer products are alcohol-based formulations containing 62%–95% of alcohol as it can denature the proteins of microbes and the ability to inactivate viruses. This systematic review correlated with the data available in Pubmed, and it will investigate the range of available hand

sanitizers and their effectiveness as well as the formulation aspects, adverse effects, and recommendations to enhance the formulation efficiency and safety. Further, this article highlights the efficacy of alcohol-based hand sanitizer against the coronavirus.

Hand sanitizer is made especially with an amalgamation of some types of alcohol such as ethyl alcohol or isopropyl, other moisturizing, gel-like ingredients such as aloe or glycerol. The ingredients also include other ingredients such as fragrances or colours.

In spite of the fact that alcohol always used as an antiseptic, hand sanitizer came into existence just a few decades back. Alcohol is the main ingredient of any hand sanitizer.

Alcohol was used to disinfect wounds in many ancient and medieval cultures around the world. However, it didn’t scientifically proved until 1875 when L. Buchholtz performed a test regarding the antimicrobial activity of

ethanol. He found that alcohol can eradicate germs by a process called cell lysis.

Hand Sanitizer and COVID-19

Hand sanitizer has been an essential part of many people's personal hygiene routines since years. Yet, the market of hand sanitizer has experienced a great boost during the coronavirus virus outbreak. When the COVID-19 pandemic broke out all of the worlds, hand sanitizer was one of the first things to go missing from supermarket shelves.

Currently, to strengthen the footprint in the global market, the leading players of hand sanitizer market have started working on the development and production of hand sanitization products. For instance, in March 2020, DOW, a notable leader in chemicals manufacturer, has launched a project of manufacturing hand sanitizer for hospitals and pharmacies to support the society during the pandemic. The company is planning to produce 300 tons of hand sanitizer per month. In addition to this, in March 2020, Coty, a significant beauty company in cosmetic manufacturers, has started manufacturing hydro-alcoholic gel hand

sanitizer amid the COVID-19 outbreak. Production and donations are expected to reach tens of thousands of units per week. The company is planning to produce 10 thousand units of hand sanitizer per week.

Hand sanitizers were first introduced in 1966 in medical settings such as hospitals and healthcare facilities. The product was popularized in the early 1990s.

Alcohol-based hand sanitizer is more convenient compared to hand washing with soap and water in most situations in the healthcare setting. Among healthcare workers, it is generally more effective for hand antisepsis, and better tolerated than soap and water. Hand washing should still be carried out if contamination can be seen or following the use of the toilet.

Hand sanitizer that contains at least 60% alcohol or contains a "persistent antiseptic" should be used. Alcohol rubs kill many different kinds of bacteria, including antibiotic resistant bacteria and TB bacteria. They also kill many kinds of viruses, including the flu virus, the common cold virus, coronaviruses, and HIV.

90% alcohol rubs are more effective against viruses than most other forms of hand washing. Isopropyl alcohol will kill 99.99% or more of all non-spore forming bacteria in less than 30 seconds, both in the laboratory and on human skin.
In too low quantities (0.3 ml) or concentrations (below 60%), the alcohol in hand sanitizers may not have the 10–15 seconds exposure time required to denature proteins and lyse cells. In environments with high lipids or protein waste (such as food processing), the use of alcohol hand rubs alone may not be sufficient to ensure proper hand hygiene.
For health care settings, like hospitals and clinics, optimum alcohol concentration to kill bacteria is 70% to 95%. Products with alcohol concentrations as low as 40% are available in American stores, according to researchers at East Tennessee State University.
Alcohol rub sanitizers kill most bacteria, and fungi, and stop some viruses. Alcohol rub sanitizers containing at least 70% alcohol (mainly ethyl alcohol) kill 99.9% of the bacteria on hands 30 seconds after application and 99.99% to 99.999% in one minute.

For health care, optimal disinfection requires attention to all exposed surfaces such as around the fingernails, between the fingers, on the back of the thumb, and around the wrist. Hand alcohol should be thoroughly

rubbed into the hands and on the lower forearm for a duration of at least 30 seconds and then allowed to air dry.

Use of alcohol-based hand gels dries skin less, leaving more moisture in the epidermis, than hand washing with antiseptic/antimicrobial soap and water.

There are certain situations during which hand washing with soap and water are preferred over hand sanitizer, these include: eliminating bacterial spores of *Clostridioides difficile*, parasites such as *Cryptosporidium*, and certain viruses like norovirus depending on the concentration of alcohol in the sanitizer (95% alcohol was seen to be most effective in eliminating most viruses). In addition, if hands are contaminated with fluids or other visible contaminates, hand washing is preferred as well as after using the toilet and if discomfort develops from the residue of alcohol sanitizer use. Furthermore, CDC states hand sanitizers are not effective in removing chemicals such as pesticides.

Benefits of Hand Sanitizers

1. **Cleanliness:**

Hand sanitizers are designed to kill germs and keep hands sanitized. With proper use, hand sanitizers are capable of eliminating 99.9% of germs on the hands. It can be used as an occasional replacement of soap and water.

2. **Portability:**

Hand sanitizers come in small, portable containers which make it easier to carry in the purse wherever you go. It works perfect when you go for a grab in public places or outside.

3. **Lessens risk of diseases:**

During the monsoon or a pandemic, frequent sanitization of hands decreases the chances of contracting the disease. Studies also show that the risk of spreading gastrointestinal (stomach) and respiratory infection is decreased by frequent use of hand sanitizer.

4. **Softer Hands:**

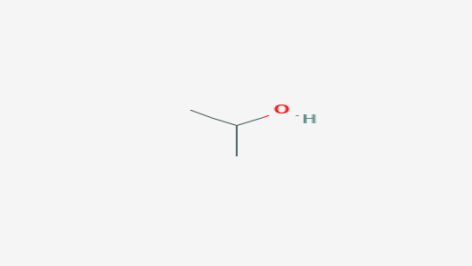
Hand sanitizers without alcohol are beneficial for the skin. It improves the texture of the skin in your hands. Some hand sanitizers comprise emollients which moisturize and soften your hands.

These are the main benefits of using hand sanitizer regularly. Using hand sanitizers on a daily basis guarantees more cleanliness and less diseases.

- ***Materials:***

ISOPROPYL ALCOHOL

Structure:



Chemical name:

propan-2-ol

Molecular Formula:

C_3H_8O or $CH_3CHOHCH_3$ or $(CH_3)_2CHOH$

Isopropyl Alcohol is an isomer of propyl alcohol with antibacterial properties. Although the exact mechanism of isopropanol's disinfecting action is not known, it might kill cells by denaturing cell proteins and DNA, interfering with cellular metabolism, and

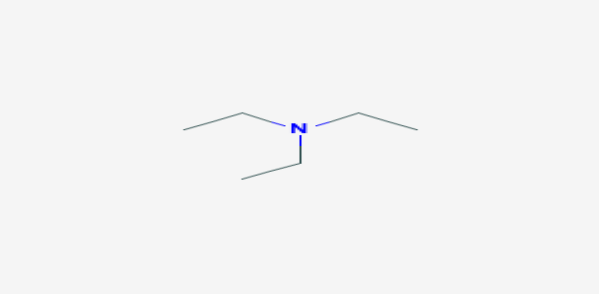
dissolving cell lipo-protein membranes. Isopropanol is used in soaps and lotions as an antiseptic.

Volatile, colourless liquid with a sharp musty odour like rubbing alcohol. Flash point of 53°F. Vapours are heavier than air and mildly irritating to the eyes, nose, and throat. Density approximately 6.5 lb / gal. Used in making cosmetics, skin and hair preparations, pharmaceuticals, perfumes, lacquer formulations, dye solutions, antifreezes, soaps, window cleaners. Sold in 70% aqueous solution as rubbing alcohol.

Propan-2-ol is a secondary alcohol that is propane in which one of the hydrogens attached to the central carbon is substituted by a hydroxy group. It has a role as a protic solvent.

TRIETHYLAMINE:

Structure:



Chemical name:

N, *N*-diethylethanamine

Molecular formula:

$C_6H_{15}N$

Triethylamine appears as a clear colourless liquid with a strong ammonia to fish-like odour. Flash point 20°F. Vapours irritate the eyes and mucous membranes. Less dense (6.1 lb / gal) than water. Vapours heavier than air. Produces toxic oxides of nitrogen when burned.

Triethylamine is a tertiary amine that is ammonia in which each hydrogen atom is substituted by an ethyl group. Acute (short-term) exposure of humans to triethylamine vapor causes eye irritation, corneal swelling, and halo vision. People have complained of seeing "blue haze" or having "smoky vision." These effects have been reversible upon cessation of exposure. Acute exposure can irritate the skin and mucous membranes in humans. Chronic (long-term) exposure of workers to triethylamine vapor has been observed to cause reversible corneal edema. Chronic inhalation exposure has resulted in respiratory and haematological effects and eye lesions in rats and rabbits. No information is available on the reproductive, developmental, or carcinogenic effects of triethylamine in humans. EPA has not classified triethylamine with respect to potential carcinogenicity.

The pK_a of protonated triethylamine is 10.75, and it can be used to prepare buffer solutions at that pH. The hydrochloride salt, triethylamine hydrochloride (triethylammonium chloride), is a colourless, odourless, and hygroscopic powder, which decomposes when heated to 261 °C.

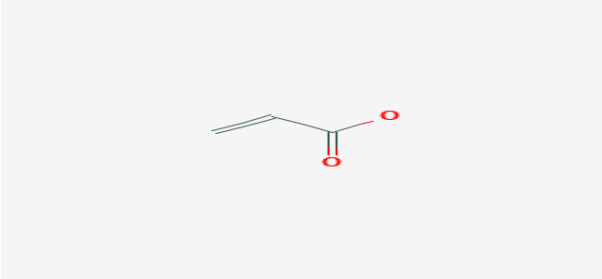
Triethylamine is soluble in water to the extent of 112.4 g/L at 20 °C.[10] It is also miscible in common organic solvents, such as acetone, ethanol, and diethyl ether.

Laboratory samples of triethylamine can be purified by distilling from calcium hydride.

In alkane solvents triethylamine is a Lewis base that forms adducts with a variety of Lewis acid such as I_2 and phenols. Owing to its steric bulk, it forms complexes with transition metals reluctantly.

- Carbopol:

Structure:



Poly(acrylic acid) (**PAA**; trade name **Carbomer**) is a synthetic high-molecular weight polymer of acrylic acid. The IUPAC name is **poly(1-carboxyethylene)**. They may be homopolymers of acrylic acid, or crosslinked with an allyl ether of pentaerythritol, allyl ether of sucrose, or allyl ether of propylene. In a water solution at neutral pH.

PAA is an anionic polymer, i.e. many of the side chains of PAA will lose their protons and acquire a negative charge. This makes PAAs polyelectrolytes, with the ability to absorb and retain water and swell to many times their original volume.

Dry PAAs are sold as white, fluffy powders that are frequently used as gels in cosmetic and personal care products. Their role in cosmetics is to suspend solid in liquids, prevent emulsions from separating and control the consistency in flow of cosmetics. Carbomer codes (910, 934, 940, 941, and 934P) are an indication of molecular weight and the specific components of the polymer.

For many applications PAAs are used in form of alkali metal or ammonium salts, e.g. sodium polyacrylate. In the dry powder form, the positively charged sodium ions are bound to the polyacrylate, however in aqueous solutions the sodium ions can dissociate. Instead of an organized polymer chain, this leads to a swollen gel that can absorb a high amount of water.

Polyacrylic acid is a weak anionic polyelectrolyte, whose degree of ionisation is dependent on solution pH. In its non-ionised form at low pHs, PAA may associate with various non-ionic polymers (such as polyethylene oxide, poly-N-vinyl pyrrolidone, polyacrylamide, and some cellulose ethers) and form hydrogen-bonded interpolymer complexes In aqueous solutions PAA can also form polycomplexes with oppositely charged polymers such as chitosan,

surfactants, and drug molecules (for example, streptomycin).

- METHOD OF PREPARATION:

AIM: FORMULATION OF COLOURED HAND SANITIZER

REQUIREMENTS: CARABOL, TRIETHANOLAMINE, WATER, ISOPROPYL ALCOHOL, COLOUR.
MEASURING CYLINDER, PIPETTE, SITTIER.

First of measure all the ingredients accurately.

Chemicals	***Quantity***
Water	*20 ml*
Carbopol	*02 gm*
Triethanolamine	*5 ml*
Isopropyl Alcohol	*75 ml*
Perfume	*Q.S.*
Colour	*Q.S.*

Mix all the ingredients in a beaker.

Place the beaker below stirrer and stir up to the gel formation.

Add colour and fragrance as per required and transfer the sanitizer to the bottle.

THANK YOU