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A Short Review on Topical Herbal Gels

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Abstract:

The wide range of pharmacological effects shown by different plant components has led to the long-standing practice of using herbal remedies to treat a wide range of chronic illnesses. Ointments, syrups, gels, creams, pills, and tablets are just a few of the various herbal dosage forms accessible today. A wide range of dermatological conditions, including burns, acne, warts, psoriasis, and some fungal and bacterial infections, may be treated using a variety of semisolid dose forms. Herbal topical gels are semisolid dosage forms that include one or more herbs in particular amounts to have a targeted therapeutic effect. They may be either clear or translucent. Skin, the rectus, the vagina, and other areas get these gels. Since synthetic medications in the present day have little side effects, herbal products are seeing tremendous appeal on a global scale. Therefore, in order to meet the demand and meet the requirement on a worldwide scale, it is essential to create more herbal formulations that have improved product quality and longevity. So, the purpose of this study is to shed light on the specific properties, methods of manufacture, and assessment criteria of herbal gels in the hopes that researchers will be able to use this information to inform the development of dosage forms including herbal gels.

Keywords: Herbal products, Topical herbal gel, Shelf life, Dermatological problems.

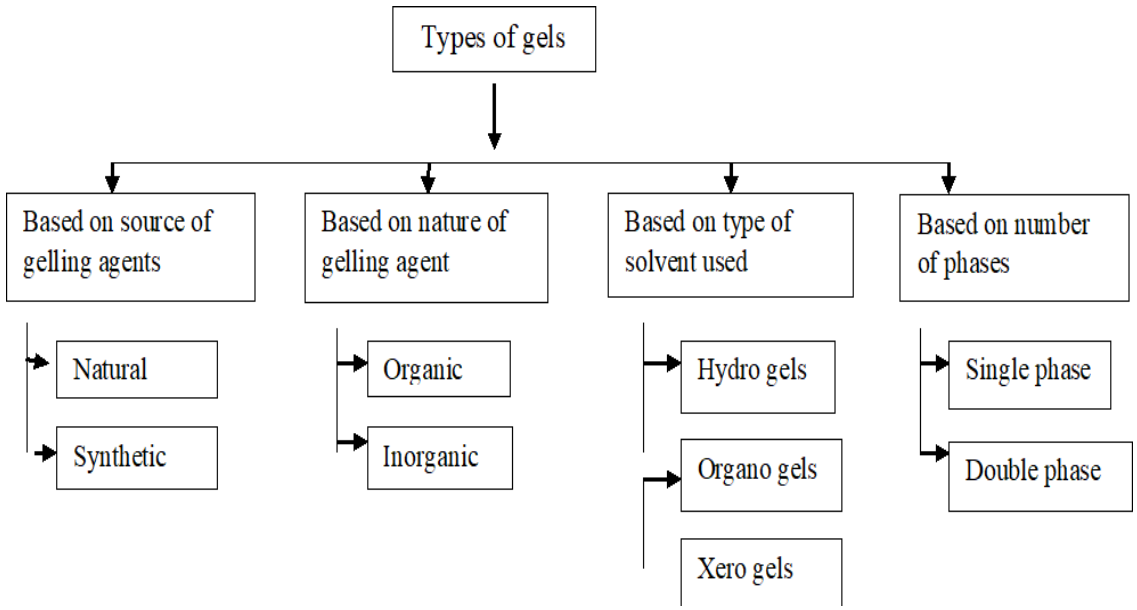
Introduction

Since herbal medications have fewer adverse effects and are more compatible with the human body, they continue to be the mainstay of primary health care in developing nations, which are home to 75–80% of the global population. Medicinal herbs are plants that have anti-inflammatory, antimicrobial, anti-inflammatory, or otherwise health-promoting characteristics. Any medicine or substance prepared from plants and utilised for therapeutic purposes falls under this category. One of the first methods of treating illness was using herbal remedies. (1). Drugs may be administered topically by a variety of channels, including the ophthalmic, rectal, vaginal, and cutaneous routes, to specific areas of the body. When it comes to topical medication delivery systems, the skin is one of the most common and easily accessible organs (2).

There are many benefits to using transdermal and topically applied dermal delivery systems instead of needles for administering many of the new biologics-based vaccines and medications. These methods also eliminate stomach degradation, frequent dosing, and first-pass hepatic metabolism. For pain relief, birth control, and urine incontinence, among other uses, the topical drug delivery system is often used when conventional methods of medication administration have failed. Inhalation, topical, sublingual, rectal, parental, and oral administration of narcotics have all played important roles in modern medicine.the third

Types of Gels

Classification of gels based on various parameters.



i) Based on source of gelling agents:

a. Natural: The term "gelling agents" refers to substances used to create gels that come from natural sources. For instance, tragacanth, starch, pectin, gelatine, etc..(5,6)

b. Synthetic: These are obtained from synthetic sources. Ex: Methyl cellulose, Hypromellose (HPMC) and Carbomer etc.,

ii) Based on nature of gelling agents:

a. Organic: The gels with gelling agents which are organic in nature for example –polyvinyl alcohols.

b. Inorganic: It includes gelling agents which are inorganic in nature such as – Bentonite, Veegum (magnesium aluminium silicate).

iii) Based on solvents used:

a. Organogels: These gels are prepared by incorporating organic solvents as their continuous phase. Ex- Metallic stearate dispersion in oils and olag aerosol gel.

b. Hydrogels: These are the gels which utilizes water as continuous liquid phase in preparation. Ex- Poloxamer gel, gelatin, Mennonite magma, cellulose derivatives.(7)

c. Xero gels: These gels contain solvent in low concentration and are prepared by freeze drying or solvent

evaporation. They can be subjected to reconstitution by swelling on addition of fresh fluid. Ex- Dry cellulose, Tragacanth ribbons and acacia.

iv) Based on number of phases:

a. Single phase: The twisted synthetic polymers with large organic molecules of the gel formers and which are generally bounded by vander waals forces or entangle with one another their random motion.(8)

b. Double phase: These upon standing are thixotropic forming semisolids and which upon agitation turns to liquid. Hence, named as double phased or two phase system. It exhibits three dimensional structures all through the gel and is comprised of smaller particles in the gel structure and is not stable always.(9)

Depending upon application gels are categorized as described below.

- Lubricating gels
- Medicated gels
- Miscellaneous gels

Lubricating gels: These gel formulations are designed to lubricate various pieces of diagnostic equipment, such as cytoscopes, rectal thermometers, surgical gloves, catheters, fingerstalls, and more. Because these gels are also inserted into sterile areas of the body, such as the urine bladder, etc., their sterility must be maintained at all times. In most cases, they are translucent, thin, and soluble in water. (10,11)

Medicated gels: These are often applied to skin and mucous membranes because of their spermicidal, antibacterial, and local anaesthetic properties. As an example, a spermicidal contraception is phenyl mercuric nitrate gel.

Miscellaneous gels: These gels mainly serve the following purposes –

a. Patch testing: To detect sensitivity these gels as vehicles for allergens are usually applied on the skin.

b. Electro-cardiography: These gels are generally made up of sodium chloride, pumice powder and glycerin and are primarily meant for application on the electrode in a way to diminish the electric resistance between electrode and patient's skin.(12-14)

Characteristics of Gels

The gels should withhold the following characteristics:

- ✓ The gelling agents used in formulations that should be inert, safe and should not interact with active ingredient and other excipients.
- ✓ The gels reserves appropriate anti-microbial activity towards microbial infections.(15)
- ✓ Gelling agents are one of the ingredient for formulation of gels, when introduce shear forces to squeeze or for topical application it will generate solid like nature during shored condition that can be easily breakable.
- ✓ The topical gels should not be viscid.
- ✓ The gels administered for ophthalmic that should be sterile.(16)

Ageing

Slow vigourous aggregation is a typical result of colloidal systems. This process is called ageing. As time goes on, a denser network of gelling agents is continually being generated throughout the gelling agent formation process.

Syneresis

There are an abundance of gels that can stand and release when they spontaneously contract with a fluid medium. What we call this is syneresis. Decreases in gelling agent concentration are associated with increases in syneresis. Syneresis is a sign that the initial gel was unstable from a thermodynamic standpoint. (17)

Swelling

When treated to liquid medium containing a suitable amount of solvates, gelling agents expand or increase in volume. The introduction of a solvent into a matrix causes this process, known as swelling. The interactions between gels are transformed into interactions between gels and solvents. In a gelling agent, the rate of swelling is proportional to the number and strength of the links between individual molecules.(18)

Rheology

The pseudo-plastic gelling agents disperse as flocculated solids in solutions; they exhibit non-Newtonian flow behaviour, which is defined by a reduction in viscosity and an increase in shear rate.(19)

Structure

The rigid structures of gels emerge from the inertness of network generated by interlinking gelling agent particles.(20)

Preparation Methodology: (5,9,27,15)

Formulation of gels often occurs at room temperature in large-scale industrial settings. On the other hand, processing of some polymers necessitated a unique method. The following are descriptions of the preparation methods:.(21)

1. Flocculation
2. Thermal changes
3. Chemical reaction

Flocculation

This approach involves creating a gel state by adding just the right amount of salt to create a precipitate, but not enough to cause total precipitation. Assuring quick mixing is necessary to counteract localised high precipitation concentrations.

For instance, if you combine benzene solutions of polystyrene and ethyl cellulose with the right amount of non-solvent, such as petroleum ether, you'll get a gel. This process results in gels that exhibit thixotropic behaviour. (22)

Thermal changes

Solvated polymers, when subjected to temperature variations, will undergo a gelling effect. Hot water dissolves most hydrogen-forming polymers far better than cold water. Polymer hydration reduces with decreasing temperature, leading to gelation. 24 and 23 The gel is made by cooling a highly concentrated solution of polymer. Some examples include guar gum, gelatine, cellulose derivatives, agar sodium oleate, and guar gum..

Chemical reaction

Chemical reaction is formulated by chemical interaction between solvent and solute.(20,6) Example: Gel of Aluminium hydroxide can be produced by interaction between aqueous solutions of aluminium salt and sodium carbonate, the greater concentration of reactants will develop a gel structure.

Evaluation of Herbal Gels: (5,7,11,27,21,17)

Physical Appearance

The formulated gel contains consistency, phase separation, color and homogeneity.

Measurement of pH

A digital pH metre was used to find the pH of the different gel formulations. For two hours, the 100 ml of distilled water solution containing 1 gramme of gel was allowed to sit. It is important to measure the pH of each sample in order to get the average triplet values..(25)

Drug content

The drug content of different gel preparation dilutions is made from a stock solution of 1 gramme of prepared gel in the solvent of your choice. The absorbance was then measured after filtering the various sample dilutions.

Homogeneity

For all prepared gels were examine the homogeneity by visual inspection. The gels are tested for their appearance and presence of any aggregates.(26)

Extrudability study

The Extrudability of gel preparations was determined by weighed quantity of gel is filled in collapsible container and the required quantity to expel 0.5 cm ribbon of gel in 10 sec.

Viscosity measurement

The gel preparation was carried out using a brook field viscometer to test the viscosity. Keep an eye out for the dial readings that coincide with the rotational rates of the gels, which ranged from 0.3 to 1.5 revolutions per minute. By multiplying the dial reading with the brook field viscometer content, we were able to calculate the viscosity of the created gels.(27)

Grittiness

In order to be suitable for topical applications, all gel formulations must be devoid of specific substances and grittiness. The gel compositions were examined under a light microscope to study the particles that were visible. (17)

Skin irritation test

Gel was tested for skin irritation using animal skin, namely that of male or female guinea pigs (400-500 gm). It was necessary to trim the animal's hair before applying the gel to the 4-centimeter area of skin. Guinea pigs had the gel administered to their skin twice daily for seven days. No response, mild patchy erythema, modest but confluent or moderate but patchy erythema, and severe erythema without or with edoema were the grades used to describe the site's sensitivity and reactivity. (14)

Stability study

The freeze-thaw cycling technique was used to conduct stability experiments on gel compositions.

This approach included heating the formed gel to 4°C for 30 minutes, then 25°C for another 30 minutes, and finally 40°C for another 30 minutes in order to examine the syneresis features. Once this is done, the gel is let to cool to room temperature and any separation of liquid is seen. (11)

CONCLUSION

The method of delivery has a major bearing on the drug's therapeutic effect. Maintaining therapeutic medication levels at the correct location of action in the body and delivering optimal drug concentrations are the goals of every drug delivery system. The skin is the primary site of administration for many skin conditions, including psoriasis, eczema, arthritis, and other skin injuries, making it an ideal organ for topical medication delivery systems. Many people prefer herbal medicines over synthetic pharmaceuticals because they believe that natural drugs are safer and have fewer adverse effects, if any at all. In light of the fact that topical herbal gels aid in the attainment of the aforementioned goals, it follows that extensive study into the formulation of such gels using natural medications and combinations thereof is required.

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