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# Implication of methods to develop herbal antimicrobial gel

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**Abstract**
Gel is defined as semi-solids which are supposed to be the suspension of small inorganic particles. In some cases, these gels are defined as large organic molecules which are interpenetrated with liquid. It is like a two-phase system where the components such as inorganic particles are insoluble but rarely dispersed over the continous phase.
Large organic molecules in the solution join together to form a flexible chain. Since, these molecules tend to have random motion; they tend to catch up with each other. This phase is single as organic molecules get dissolved. Due to the unique behavior of large molecules in the solution, gels show the two-way system. The current article describes the methods to develop herbal antimicrobial gel.

**Keywords:** Gel, Molecule, Solution.

## Introduction
Gels can be used as delivery system for oral penetration in the form of liquid or capsule shells made from gelatin. These can also be directly applied over the skin, eye and other external parts of body. With the help of local therapy, the systematic use of drugs have also reduced. In case of topical therapy, gel is used with the non-steroidal anti-inflammatory drugs like felbinac, piroxicam, and ketoprofen.
A structural network is required to form a gel and this network is created with the help of polymers. These polymers may include carbomers, cellulose or natural germs. Human skin acts as a defense system so as to protect the body from the attacks of bacterial pathogen.
The natural defense system of the skin tends to lower down when the veracity of the skin is compromised. In case, when the protecting system of skin reduces then the use of gel is done so as to secure the body from the bacteria attack. These bacteria are very harmful as they may lead to a vital disease.
Microcrystalline cellulose can be used to form the gels. The cellulose contains hydrophilic polymer which protects them from the electrolytes. The powdered material is broken down into small pieces with the help of high shearing. As a result of using high shearing, a network is generated which is highly bonded.
It is also observed that a mixture of water, mineral oil and non-ionic surfactants can be used to form the clear gels. The characteristics of gel depend on the proportion and concentration of the ingredients. This type of gel is extensively used for the purpose of making hair-grooming products.
Gel can also be formed with the help of waxy materials. Aluminium stearate, a hydrophobic soap, has been employed as a bodying agent in oils for many years. These gelling agents are generally incorporated by fusion. High molecular weight poly(ethylene oxide) , cross-linked by high energy irradiation can form hydrogels at concentrations of about 5%.
Applications include use as culture media and treatment of burned skin.
With skin permeation studies, investigators often use an in vitro protocol with a membrane clamped between two compartments, one of which contains a drug formulation (the donor) and the other compartment holding a receptor solution which provides sink conditions (essentially zero concentration).
Topical antimicrobial agents, both antiseptics and antibiotics, are currently used to reduce the risk of infection. Although microbial resistance rates are not equally distributed around the

world, microbial resistance to antibiotics has become a worldwide medical, economical, and public health problem. The overuse, misuse, and widespread prophylactic use of antimicrobial drugs are some factors leading to the emergence of drug resistant microorganisms.

**Methods to Prepare Gel**

**1. Alginates**

These are polysaccharides, containing varying proportions of p-mannuronic and L-guluronic acids derived from brown seaweed in the form of monovalent and divalent salts. Although other alginate salts are available commercially, sodium alginate is by far the most widely used. The National Formulary(NF) defines sodium alginate as "the purified carbohydrate product extracted from brown seaweed..." and goes on to say: " It consists chiefly of the sodium salt of algnic acid, a polyuronic -mannuronic acid residues linked so that the carboxyl group ofρ-βacid composed of each unit is free, while the aldehyde group is shielded by a glycosidic linkage".

Gelation occcurs by reduction of pH or reaction with divalent cations. Reduction of pH converts the carboxylate ions to free carboxyl groups. This reduces hydration of polymer segments as well as the repulsion between them. Generally, some calcium must be present; the small amounts contributed by the alginate may be sufficient. The pH at which gelation occurs is inversely related to the amount of calcium in solution. Alginates with low residual calcium begin to gel below a pH of 4.

**2. Carrageenan**

Carrageenan, the hydrocolloid extracted from red seaweed, is a variable mixture of sodium, potassium, ammonium, calcium, and magnesium sulfate esters of polymerized galactose, and 3,6-anhydrogalactose.All the carrageenans are anionic . Gels of kappa-carrageenan, which tend to be brittle, are strongest in the presence of potassium ion; gels of iota-carrageenan, which tend to be brittle, are strongest in the presence of potassium ion; iota-carrageenan gels are elastic and remain clear in the presence of calcium. Various commercial grades are available for particular applications, mainly in the food industry.

**3. Tragacanth**

Tragacanth is defined in the NF as the "dried gummy exudation from Astragalus gummifer L, or other Asiatic species of Astragalus (Fam. Leguminosae)." Tragacanth is a complex material composed of an acidic polysaccharide (Tragacanthic Acid) containing calcium, magnesium, and potassium, and a smaller amount of a neutral polysaccharide. Tragacanthin. The gum swells in water; concentration of 2% or above of a "high quality" gum produces a gel. Hydration takes place over a period of time, so that development of maximum gel strength requires several hours. The rheological properties of Tragacanth dispersions depend on the grade used as well as its treatment.

**4. Pectin**

Pectin, the polysaccharides extracted from the inner rind of citrus fruit or apple pomance , may be used in pharmaceutical jellies as well as in foods. The gel is formed at an acid pH in aqueous solutions containing calcium and possibly another agent that acts to dehydrate the gum.

Gel formation is more extensive in pectins with a low methoxyl content. Such properties as gel strength depend on a host of factors, which include concentration of additives and pH, in addition to the characteristics of the raw material.

**5. Xanthan Gum**

Although xanthan gum is used most frequently as a stabilizer in suspensions and emulsions at concentrations below 0.5%, higher concentrations in aqueous media (1% and above) yield viscid solutions that are jellylike in nature.

Xanthan gum is produced by bacterial fermentation and its availability and quality are not subject to many of the uncertainties that affect other natural products, particularly those that are extracted from plants whose habitat falls within politically unsettled parts of the world. Thermally reversible gels result from combinations of xanthan with guar or locust bean gum.

**Conclusion**

Different strategies have been proposed to achieve efficient drug delivery systems and in the last few years hydrogels and gels in general have been considered as good candidates for oral, rectal, ocular, cutaneous and subcutaneous administration of drugs. Hydrogels in particular have been widely utilized in the medical and pharmaceutical field for their biocompatibility and their similarity to a natural tissue.

Gels are semisolid systems in which the movement of the dispersion medium is restricted by interlacing three dimensional network of particles or solvated macromolecules of dispersed phase. The increased viscosity caused by interlacing and consequential internal friction is responsible for the semisolid state. A gel may also consist of twisted and matted strands often tied together by stronger types of Vander Waals forces to form crystalline and amorphous regions throughout the system.

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