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HERBAL ANTI-ACNE GELS – A MINI REVIEW

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ABSTRACT

Acne vulgaris (usually known as acne) is a usual skin condition, as a result of adjustments withinside the pilosebaceous units, pores and skin systems, including a hair follicle and its related sebaceous gland through androgen stimulation. Acne in adult woman might also additionally begin at some point of youth and persist or have an onset in adulthood. Topical route is the main part of acne treatment. Papulopustulosa and Acne comedonica are the conditions which are present in more than 50% of acne population. Presence of small nodes, scars, systemic comedication indicates acne. Hyperseborrhea, hyperkeratosis, microbial colonization and inflammation are the four pathogenic conditions of acne. Drugs like benzoyl peroxide, antibiotics, retinoids tretinoin, isotretinoin, adapalene and tazarotene and azelaic acid are having comedolytic and anticomedogenic activity against acne. Antiandrogenic agents are also available to treat seborrhea, commonly used erythromycin and clindamycin are resistant to Propionibacterium acnes. The present review focuses on herbal anti acne gels and naturally available anti acne sources.

KEYWORDS: Acne vulgaris, gels, Semi solid dosage forms, Herbal gels.

INTRODUCTION

Gels (sometimes called Jellies) are semisolid systems consisting of either suspension composed of small inorganic particles or large organic molecules interpenetrated by a liquid.[1] When the gel mass consists of a network of small discrete particles, the gel is classified as a two-phase system (e.g., Aluminium Hydroxide Gel, USP). In a two-phase system, if the particle size of the dispersed phase is relatively large, the gel mass is sometimes referred to as magma (e.g., Bentonite Magma NF).[2] Both gels and magmas may be

thixotropic, forming semisolids after standing and becoming liquid when agitated. They should be shaken before use to ensure homogeneity and should be labelled to that effect.[3,4] Single-phase gels consist of organic macromolecules uniformly distributed throughout a liquid with no apparent boundary between the dispersed macromolecule and liquid.[5]

ACNE VULGARIS

Acne vulgaris is the most common form of acne. According to a study in The Journal of the American Academy of Dermatology, acne vulgaris usually begins during puberty, but often extends into the twenties, thirties, and beyond. It can appear all over the body but is most common on the face, neck, chest, and back.[6,7]

Types of lesions that are common in acne vulgaris are.

- **Papules** – Red, inflamed bumps on the skin that feel tender and have no head are called papules. Squeezing a papule will not get rid of it faster and may cause scarring.[8]
- **Whiteheads** – Whiteheads result from a pore that is blocked completely. The trapped oil, bacteria, and dead skin cells cause a white head to form on the skin's surface. They are often treated with over-the-counter acne products.[9]
- **Blackheads** – When a pore is partially blocked, blackheads often form. The trapped bacteria, oil, and dead skin slowly drain to the surface of the skin to form a blackhead. The dark color is caused by melanin in the skin reacting with oxygen. Blackheads typically take a longer time to clear than whiteheads.[10]
- **Pustules** – Pustules are the most common type of acne lesion. They usually appear as an inflamed red circle with a center that is white or yellow. They can be popped at home, but acne sufferers shouldn't touch them with their bare hands and make sure that the material they are touching the skin with is sterile. Acne medications may be more effective after the pustule has been popped.[11]
- **Nodules** – Severe acne often causes nodules. Acne nodules are hard bumps under the skin that may be large and last for months. Scarring is a common side effect of nodular acne, so it's a good idea for anyone with nodular acne to visit a dermatologist for proper treatment.[12]

Fig no.1: Different types of leisons in acne vulgaris.

Clinical Presentation[13,14]

Causes of Acne Vulgaris

1. Infectious Contribution

Staphylococcus aureus and Propionibacterium acnes have been attributed to acne vulgaris. However, their exact contributions to the acne process are not entirely clear. There are sub-strains of P. acnes in normal skin and some others in long-term acne complications. Therefore, it is unclear whether these strains are involved in this condition or they are pathogenically acquired. Resistance of P. acnes to commonly used drugs has been shown to be increasing. These strains are able to change, perpetuate, or adapt to the abnormal oil production, inflammation, and inadequate sloughing of acne pores. Infection with Demodex, which is a parasitic mite has been shown to be associated with the development of acne. However, eradication of the mites has not improved acnes.[15]

2. Dietary Contribution

The relationship between diet and acne is unclear as there is no good-quality evidence. However, a high level of glycemic diet has been shown to be associated with worsening of acne vulgaris. A positive correlation between the use of milk, chocolates or salt, and an increase in the severity of acne vulgaris has also been suggested. However, the contribution of chocolates is disputable, as they can be made with different amounts of sugar, with or without milk. A relationship between obesity and acne has also been reported.

3. Genetic Contribution

For specific subjects, the predisposition to acne might be explained by a genetic component. This suggestion has been supported by some studies that have evaluated the rate of acne

among first-degree relatives, as well as twin studies. There are varieties of genes, which have been attributed to acne, such as polymorphisms in IL-1α, TNF-α, and CYP1A1 amongst others.

4. Hormonal Changes

Hormonal changes, such as puberty and menstrual cycles, seem to contribute to the formation of acne vulgaris. An increase in some sex hormones, especially in androgens during puberty and pregnancy, causes the follicular glands to produce more sebum. The use of anabolic steroids usually has similar effects. The hormones, which have been attributed to acne vulgaris consist of testosterone, dehydroepiandrosterone, and dihydrotestosterone, as well as insulin-like growth factor. The development of acne vulgaris in adult women might be due to an underlying condition such as Cushing syndrome, polycystic ovary syndrome, or hirsutism.

5. Psychological Contribution

Some scientific researchers have indicated that acne severity is correlated with an increase in stress level and stress has been listed as a factor attributed to acne flare.

Table no 1: Naturally available Anti-Acne Resources.[16,17]

S.No	Common name	Biological name	Active constituents
1	Neem	*Azadirachta indica*	azadirachtin
2	Tulsi (Basil)	*Ocimum tenuiflorum*	Oleanoic acid
3	Turmeric	*Curcuma longa*	curcumin
4	Nutmeg	*Myristica fragrans*	myristicin
5	Black pepper	*Piper nigrum*	piperine
6	Amla	*Phyllanthus emblica*	ascorbic acid
7	Aloe vera	*Aloe barbadensis miller*	acemannan
8	Cinnamon	*Cinnamomum verum*	cinnamaldehyde
9	Garlic	*Allium sativum*	allicin
10	Manjistha	*Rubia cordifolia*	manjistin

Table no.2: Different strains causes acne.[18]

Name of the strain	Type of strain
Malassezia yeast/Malasesszia folliculities	Fungal
Pityrosporum folliculities	Fungal
Staphylococcus aureus	Bacterial
Propionibacterium	Bacterial
Molluscum contagiosum	Viral

Signs and Symptoms[19]

Fig no.2: Signs and symptoms of acne.

Classification of Gels[20]

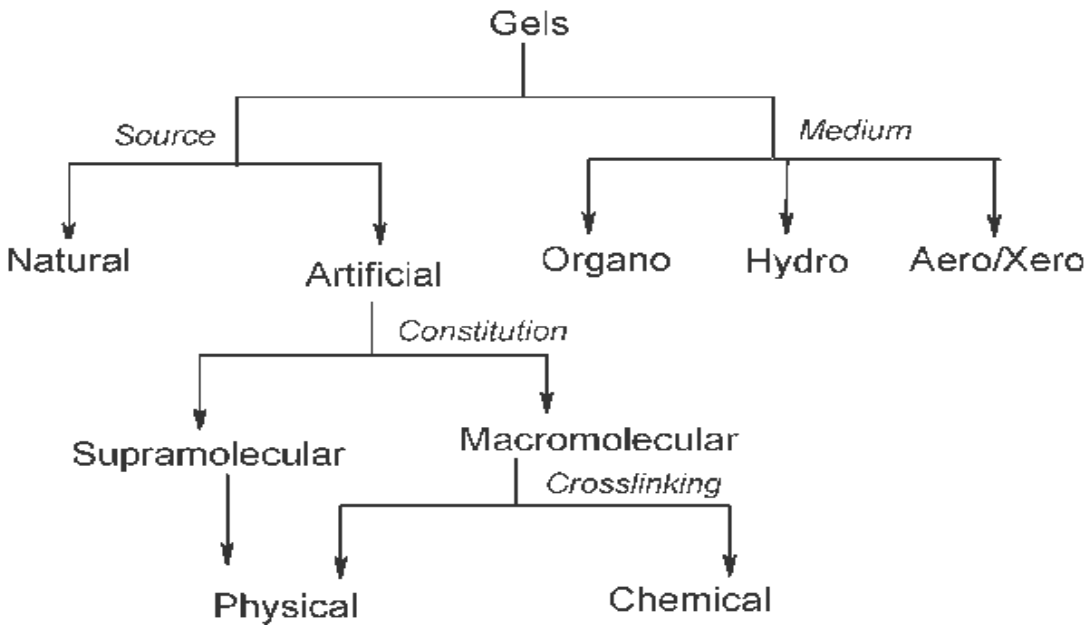


Fig no.3: classification of gels.

Preparation Methods of Gels[21]

Gels are normally in the industrial scale prepared under room temperature. However few of polymers need special treatment before processing. Gels can be prepared by the following methods.

1. Thermal changes.
2. Flocculation.
3. Chemical reaction.

1) Thermal changes.

Solvated polymers (lipophilic colloids) when subjected to thermal changes cause gelatin. Many hydrogen formers are more soluble in hot than cold water. If the temperature is reducing, the degree of hydration is reduced and gelatin occurs. (Cooling of a concentrated hot solution will produce a gel). e.g.: - Gelatin, agar sodium oleate, guar gummed and cellulose derivatives, etc. In contrast to this, some materials like cellulose ether have their water solubility to hydrogen bonding with the water. Raising the temperature of these solutions will disrupt the hydrogen bonding and reduced solubility, which will cause gelation. Hence this method cannot be adopted to prepare gels as a general method.[22]

2) Flocculation

Here gelation is produced by adding just a sufficient quantity of salt to precipitate to produce an aging state but insufficient to bring about complete precipitation. It is necessary to ensure rapid mixing to avoid a locally high concentration of precipitant. e.g.: The solution of ethylcellulose, polystyrene in benzene can be gelled by rapid mixing with suitable amounts of a non-solvent such as petroleum ether.[23] The addition of salts to hydrophobic solution brings about coagulation and gelation is rarely observed. The gels formed by the flocculation method are Thixotropic in behavior. Hydrophilic colloids such as gelatin, proteins, and acacia are only affected by high concentrations of electrolytes, when the effect is to “salt out”, the colloidal and gelation doesn’t occur.

3) Chemical reaction

In this method, the gel is produced by chemical interaction between the solute and solvent. E.g.: aluminum hydroxide gel can be prepared by interaction in an aqueous solution of aluminum salt and sodium carbonate, an increased concentration of reactants will produce a gel structure. Few other examples involve chemical reactions between PVA, cyanoacrylates with glycidol ether (Glycidol), toluene diisocyanates(TDI), methane diphenyl isocyanate (MDI)hat cross-links the polymeric chain.

Gel Forming Substances

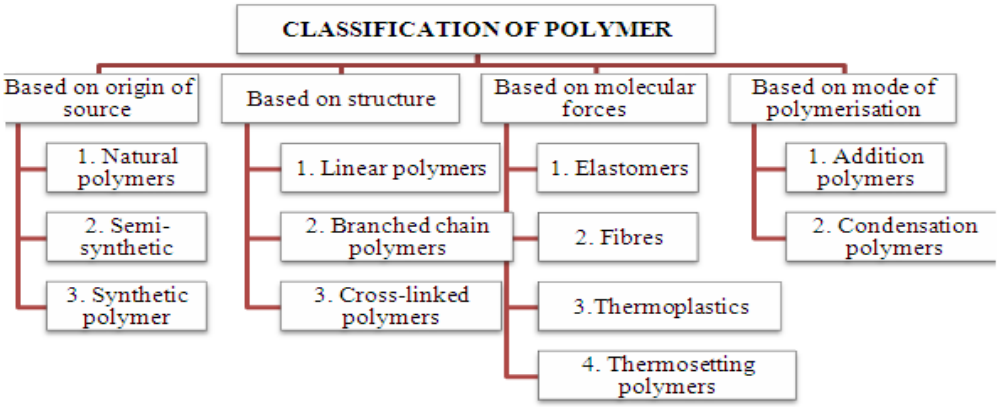
Polymers[24]

Polymers are used to give the structural network, which is essential for the preparation of gels. They are the high molecular weight compounds or macromolecules composed of many repeating subunits called "Monomers" connected by Covalent bonds or chemical bonds. The

reaction involving a combination of two or more monomer units to form a long chain polymer is termed polymerization.

These are widely used as Pharmaceutical aids like suspending agents, Emulsifying agents, Adhesives, Coating agents, Adjuvants, etc. Packing materials and medical devices both in conventional and controlled drug delivery systems.

Classification of Polymers[25]



Evaluation Parameters of the Formulated Gels[26]

Measurement of pH

The pH of various gel formulations was determined by using a digital pH meter. One gram of gel was dissolved in 100 ml distilled water and stored for two hours. The measurement of pH of each formulation was done in triplicate and average values are calculated.

Drug content

1 g of the prepared gel was mixed with 100ml of a suitable solvent. Aliquots of different concentrations were prepared by suitable dilutions after filtering the stock solution and absorbance was measured. Drug content was calculated using the equation, which was obtained by linear regression analysis of the calibration curve.

Viscosity study

The measurement of viscosity of the prepared gel was done with a Brookfield Viscometer. The gels were rotated at 0.3, 0.6, and 1.5 rotations per minute. At each speed, the corresponding dial reading was noted. The viscosity of the gel was obtained by multiplication of the dial reading with the factor given in the Brookefield Viscometer catalogs.

Spreadability

It indicates the extent of the area to which gel readily spreads on application to the skin or affected part. The therapeutic potency of a formulation also depends upon its spreading value. Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel which is placed in between the slides under the direction of a certain load. Lesser the time is taken for the separation of two slides, the better the spreadability.

It is calculated by using the formula.

S = M. L / T where,

M = wt. tied to upper slide

L = length of glass slides

T = time taken to separate the slides

Extrudability Study

After the gels were set in the container, the formulations were filled in the collapsible tubes. The extrudability of the formulation was determined in terms of weight in grams required to extrude a 0.5 cm. ribbon of gel in 10 seconds.

Skin Irritation study

Guinea pigs (400-500 g) of either sex were used for testing of skin irritation. The animals were maintained on standard animal feed and had free access to water. The animals were kept under standard conditions. Hair was shaved from the back of guinea pigs and an area of 4 cm2 was mark done both sides, one side served as control while the other side was tested. The gel was applied (500 mg/guinea pig) twice a day for 7 days and the site was observed for any sensitivity and the reaction if any, was graded as 0, 1, 2, 3 for no reaction, slight patchy erythema, slight but confluent or moderate but patchy erythema and severe erythema with or without edema, respectively.[27]

***In vitro* Diffusion studies**

The diffusion studies of the prepared gels can be carrying out in Franz diffusion cell for studying the dissolution release of gels through a cellophane membrane. A gel sample (0.5g) was taken in the cellophane membrane and the diffusion studies were carried out at 37 ± 1° using 250 ml of phosphate buffer (pH 7.4) as the dissolution medium. Five milliliters of each sample were withdrawn periodically at 1, 2, 3, 4, 5, 6, 7, and 8 h and each sample was

replaced with an equal volume of fresh dissolution medium. Then the samples were analyzed for the drug content by using phosphate buffer as blank.

Stability

The stability studies were carried out for all the gel formulations by freeze-thaw cycling. Here, by subjecting the product to a temperature of 4° C for 1 month, then at 25°C for 1 month, and then at 40°C for 1 month, syneresis was observed. After this, the gel is exposed to ambient room temperature and liquid exudate separating is noted.

Homogeneity

After the gels have been set in the container, all developed gels were tested for homogeneity by visual inspection. They were tested for their appearance and presence of any aggregates.

Grittiness

All the formulations were evaluated microscopically for the presence of any appreciable particulate matter which was seen under a light microscope. Hence obviously the gel preparation fulfils the requirement of freedom from particular matter and from grittiness as desired for any topical preparation.

CONCLUSION

Various systemic and topical drugs are available to treat acne, sometimes which can confuse the treating dermatologist. A multitude of treatment choices is out there to treat woman patients with acne. Treatment options should be customised to the individual patients by considering the patient's tolerability, preferences, and psychosocial factors. To treat this common and effectual disease many Novel agents still be developed to treat patients with Acne, which can further strengthen the clinician's care of patients. Many herbal drugs are substituted in the treatment of the acne. Similar relations has also formed in india with evidence based recent recommendations.

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CONFLICTS OF INTEREST

None.

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