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## A Brief Review on Antidandruff Hair Gel Based on Ayurveda

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**Abstract** Dandruff is a skin disease whose symptoms include peeling and sometimes mild itching caused by the scalp. These are many bacteria, fungi that cause scalp infections that lead to more hair problems or skin problems. Candidiasis is a common condition on the skin or mucous membranes usually caused by candida. Herbal extracts of gauva leaves, amla and aloe are effective in treating candidiasis. The leaves show antibacterial and antifungal activity against Gram positive and Gram negative bacteria. Vitamin C in mangoes which is 20 times more than oranges; Which prevents premature graying of hair, it also gives hair shine and strengthens hair. Gauva leaf extract fungi *c. albicans* and bacteria *s. Guava* leaf extract was evaluated against aureus using cup-and-plate method. Herbal gels were prepared and evaluated using carbopol 934, triethanolamine etc. Multi herbal hair gel is effective against candidiasis, nourishes hair and prevents premature gray hair.

**Keywords** Antidandruff hair gel, candidiasis, Multi herbal hair gel, triethanolamine

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### Introduction

The Etiology of Seborrheic Dermatitis remains un identified, though many factors, including hormonal have been occupied. This chronic inflammatory disorder is normally limited to area where these sebaceous glands are present like head. In this condition of skin, the skin becomes crumbling. This type of dermatitis on scalp is harsh type of dandruff. When this type of dermatitis affect the scalp various people call it as dandruff. Seborrheic dermatitis occurs when in the neonatal period, it generally disappears by six to twelve months suggesting that it possibly are spend to maternal hormone stimulation [1]. Seborrhoea dermatitis often affects people in post puberty. Further facts of hormonal influence is provided by research indicating that the human sebocyte responds to androgen stimulation. Although specific details remaining known *Pityrosporum Ovale* is mainly found to take part in the demonstrating of the Seborrhoea dermatitis. The migration rate of occupied skin by this organism may be lesser than of normal skin. Classified Common sites of dandruff distribution: The distribution is naturally symmetric and general sites of distribution are Hairy areas of head, Forehead, Clotrimazole is an imidazole derivative with a broad spectrum anti mitotic activity. it acts by inhibiting bio synthesis of ergo sterol, an important component of fungal cell membranes. It is widely used for the treatment of local candidacies, vaginal yeast infections; topical applications include fungal infections such as ring worm, athletes foot and jock itch. Its action leads to increased membrane permeability and apparent disruption of enzymesystems bound to the membrane. The major drawback of this drug is its insolubility in water. The techniques generally employed to enhance the solubility of poorly water soluble drugs are, use of surface-active agent, hydrates and solvates, polymorphism, compaction, solid dispersion. Among this Solid dispersion is a unique technique used to increase solubility, dissolution and bioavailability of poorly water-soluble drugs [2]. Conventional method for preparing solid dispersion includes solvent wetting method, physical mixture, complex formations, and so Creams, gels, ointments and pastes are some of the topical semisolids in use for many decades.



The extensive studies on release properties have revealed that the active ingredients in gel based formulations are better per cutaneously absorbed than cream or ointment bases. Topical drug administration is a localized drug delivery system anywhere in the body through ophthalmic, rectal, vaginal and skin as topical routes. Topical drug delivery can be defined as the application of a drug containing formulation to the skin to directly treat coetaneous disorders (e.g. acne) or the coetaneous manifestations of a general disease (e.g. psoriasis) with the intent of containing the pharmacological or other effect of the drug to the surface of the skin or within the skin. Skin is one of the most readily accessible organs on human body for topical administration and is the main route of topical drug delivery system. It affords to maintain applied preparation intact for a prolonged time and this has resulted in its increasing use as a route of administration whether for local, regional or systemic effects. Topical anti fungal are the agents, meant for topical use for fungal infection. Topical application of drug at the affected site offers potential advantage of delivering drug directly to the site of action. Local infection can be treated by application of products which form transparent water vapours and air permeable film over the skin surfaces, from which drug releases continuously to the skin site and skin structure infection and the disease of the patient would be treated. At present, there are number of antifungal agents use topical applications like clotrimazole, griseofulvin, itraconazole, fluconazole etc. Clotrimazole was used as a model drug. Clotrimazole is an imidazole derivative with a broad spectrum anti mycotic activity. It acts by inhibiting biosynthesis of ergosterol, an important component of fungal cell membranes [3].

### Causes of Dandruff

The cause of dandruff is un defined. Now there are so many experts who think that the dandruff is not caused by the poor cleanliness. Persons who are highly sensitive to yeast having high improbability of having dandruff. That's why we can say that the yeast may play an important part in causing dandruff. *Malassezia* is a type of fungi and its sensitive people who get dandruff find that it gets lost during the warmer season and higher in cold. UV light from the sun interacts with the yeast. Several say, that during winter skin becomes dried due to cold air and hot area temperature, that causes dandruff more liable. Fungi *Malassezia* is generally present on everyone's scalp. Normally, this fungus does not show any problem. Though, it can grow un control. It nourished by the oils and by the hair follicles secretion. When occurs, the scalp can become irritated and produces extra skin cells. After that the extra skin cell side and fall off. Then they mix with the oil of the hair and scalp, and turn into a flaky scale which we can say as dandruff [4].

**Seborrheic dermatitis:** Person who suffers from seborrhoea dermatitis are more sensitive to dandruff. Seborrhoea dermatitis affects various areas of the skin include the back of the ears, the breastbone, eyebrows, and the sides of the nose, not only on the scalp. The patient who suffers with this disease will have red, greasy, itchy, irritates skin covered with flaky white scales. Disease conditions: People with psoriasis, eczema and some other skin disorders have a tendency to get dandruff much more often than other people. Adults with Parkinson's disease and some other neurological disease are more prone to having dandruff and seborrhoea dermatitis. Patients who having heart disease and they recover from heart attack having dandruff more than the other persons.

**Oil-Related Dandruff:** This kind of dandruff is commonly found due to the gathering of oils in the skin and scalp. It may result because of irregular cleanliness practices. This type of dandruff is generally occurred by improper washing of hair and not enough shampooing. Sebaceous glands are found in the scalp which secretes oil. This production and release of Sebum oil is a natural incident in human beings and it make an important part of healthy hair. Alternatively, if this sebum is not cleared regularly, it can binned with dead skin and dirt which foremost to the formation of dandruff

Plan of Work:

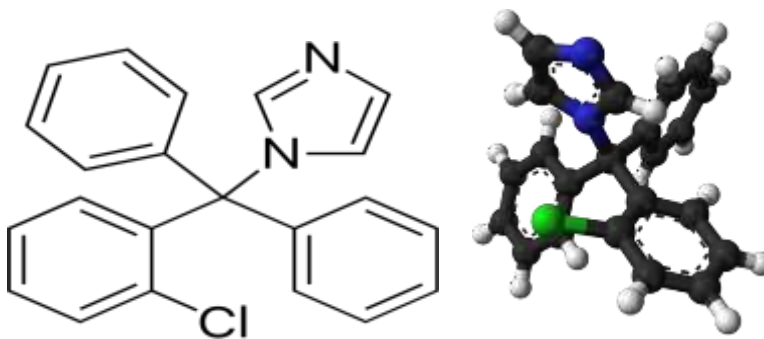
The present research study is planed with the following objectives.

1. To prepare anti dandruff hair gel.
2. To perform solid dispersion study of Clotrimazole.



3. To formulate the hair gel of Clotrimazole.
4. To complete the Clotrimazole compatibility study.
5. To evaluate the formulations with respect to various physical parameters.
6. To evaluate the formulations with respect to anti-microbial properties.

## Drug



### Profile:

#### Clotrimazole

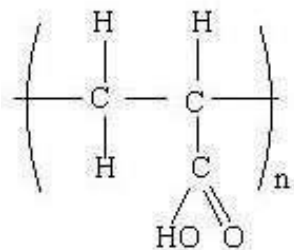
Trade Names – Desenex, Canesten

Route of Administration – Topical, Throat, Lozange Bioavailabilty- Poor absorption

Protein Binding 90% Metabolism – Liver

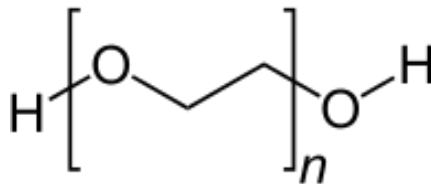
**Clotrimazole**, sold under the brand name Canesten among others, is an antifungal medication. It is used to treat vaginal yeast infections, oral thrush, diaper rash, pityriasis versicolor, and types of ringworm including athlete's foot and jock itch. It can be taken by mouth or applied as a cream to the skin or in the vagina. Common side effects when taken by mouth include nausea and itchiness. When applied to the skin common side effects include redness and burning. In pregnancy, use on the skin or in the vagina is believed to be safe. There is no evidence of harm when used by mouth during pregnancy but this has been less well studied. When used by mouth, greater care should be taken in those with liver problems. It is in the azole class of medications and works by disrupting the cell membrane. Clotrimazole was discovered in 1969. It is on the World Health Organization's List of Essential Medicines, the most important medications needed in a basic health system. It is available as a generic medication. The wholesale cost in the developing world as of 2014 is 0.20–0.86 USD per 20gm tube of cream. In the United States a course of treatment typically costs less than 25 USD [5].

#### Carbopol 940-



Carbopol polymers are extremely efficient thickening polymers that are most often used to thicken cleaning formulas for many different applications. Carbopol yields crystal-clear water-based gels that are freeze-thaw stable and will not vary in viscosity with temperature. They will work in nearly any system where these conditions are met.





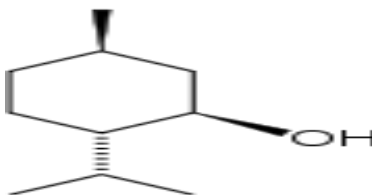
### **Polyethylene glycol (PEG)**

It is a polyether compound with many applications from industrial manufacturing to medicine. PEG is also known as polyethylene oxide (PEO) or poly oxy ethylene (POE), depending on its molecular weight. The structure of PEG is commonly expressed as  $H-(O-CH_2-CH_2)_n-OH$ . PEG is generally considered biologically inert and safe. However, a minority of people are allergic to it. Allergy to PEG is usually discovered after a person has been diagnosed with an allergy to an increasing number of seemingly unrelated products, including processed foods, cosmetics, drugs, and other substances that contain PEG or were manufactured with PEG [6].

**Methyl paraben** also methyl paraben, one of the parabens, is a preservative with the chemical formula  $CH_3(C_6H_4(OH)COO)$ . It is the methyl ester of p-hydroxybenzoic acid. Methyl paraben is an anti-fungal agent often used in a variety of cosmetics and personal-care products. It is also used as a food preservative and has the E number E218. Methylparaben is commonly used as a fungicide in *Drosophila* food media. To *Drosophila*, methyl paraben is toxic at higher concentrations, has an estrogenic effect, and slows the growth rate in the larval and pupal stages at lower concentrations [7].

**Poly vinyl pyrrolidone (PVP)** also commonly called polyvidone or povidone, is a water-soluble polymer made from the monomer N-vinyl pyrrolidone. PVP was used as a plasma volume expander for trauma victims after the 1950s. It is used as a binder in many pharmaceutical tablets; it simply passes through the body when taken orally. However, autopsies have found that crospovidone (PVPP) contributes to pulmonary vascular injury in substance abusers who have injected pharmaceutical tablets intended for oral consumption. The long-term effects of crospovidone or povidone within the lung are unknown. PVP added to iodine forms a complex called povidone-iodine that possesses disinfectant properties. This complex is used in various products like solutions, ointment, pessaries, liquid soaps and surgical scrubs. It is known under the trade names Pyodine and Betadine among a plethora of others. It is used in pleurodesis (fusion of the pleura because of incessant pleural effusions). For this purpose, povidone iodine is equally effective and safe as talc, and may be preferred because of easy availability and low cost. Povidone is used as a lubricant in some eye drops, e.g. Bausch & Lomb's Soothe [8].

### **Menthol**



It is an organic compound made synthetically or obtained from corn mint, peppermint, or other mint oils. It is a waxy, crystalline substance, clear or white in color, which is solid at room temperature and melts slightly above. The main form of menthol occurring in nature is (-)- menthol, which is assigned the (1R, 2S 5R) configuration. Menthol has local anesthetic and counterirritant qualities, and it is widely used to relieve minor throat irritation. Menthol also acts as a weak kappa opioid receptor agonist. Menthol's ability to chemically trigger the cold-sensitive TRPM8 receptors in the skin is responsible for the well-known cooling sensation it provokes when inhaled, eaten, or applied



to the skin. In this sense, it is similar to capsaicin, the chemical responsible for the spiciness of hot chilis (which stimulates heat sensors, also without causing an actual change in temperature). Menthol's analgesic properties are mediated through a selective activation of  $\kappa$ -opioid receptors. Menthol also blocks voltage-sensitive sodium channels, reducing neural activity that may stimulate muscles. A study showed that topical absorption of ibuprofen is not increased by menthol, but does note the complementary effect of the menthol as a pain reliever itself.

Some studies show that menthol acts as GABAA receptor positive allosteric modulator and increases GABAergic transmission in PAG neurons. Menthol also shares anaesthetic properties similar to propofol, by modulating same sites of GABAA receptor. Menthol is widely used in dental care as a topical antibacterial agent, effective against several types of streptococci and lactobacilli.

### **Titrimetric measurement**

10 ml of samples were withdrawn and transferred to conical flasks at 20 minutes interval for 2 hours and replenished with fresh media 10 ml. The clotrimazole content was estimated titrimetrically as described in B.P. 1 ml of 0.1 M *per chloric acid* is equivalent to 34.48 mg of  $C_{22}H_{17}ClN_2$ .

### **Antifungal activity**

The hair gel formulation which showed optimal release was subjected to antifungal activity by adopting disc diffusion method at Star tech Labs, Hyderabad. The test organism was *Pityrosporum Ovale* (strain 27) in seawater dextrose agar media. Commercial Clotrimazole ointment was taken as standard. Clotrimazole is a well known effective antifungal drug and it is available as a topical formulation.

### **Result and Discussion**

**Active content and physical appearance:** The formulations evaluated for the active content. The results were found in acceptable range and % of drug content shown in table.

**pH determinations:** It was found that all the formulations have pH. in range 6.80 to 7.11 that suited the hair changes were found for the tested parameters.

**Extrudability determination-:** The results of the Extrudability indicate that the had better Extrudability than to All formulation showed good Extrudability when extruded from metallic collapsible tube.

### **In-Vitro study**

**Diffusion Study-** In vitro diffusion study was carried out using the procedure as described earlier.

**Comparative Drug Release Profile-** Comparative *in vitro* drug release profile

### **Antifungal activities**

Among the formulations, showed better release and maximum zone of inhibition than other formulation. Hence, Hair gel formulation was considered as best formulation. The hair gel formulation was subjected to stability performance as it was exhibited good drug release and exhibited maximum zone of inhibition when compared to other formulations. The stability study was conducted for the period of 3 months. The parameters like Appearance, pH Extrudability, Colour, % drug content were tested at the every month. No appreciable changes were found for the tested parameters.

### **Summary**

Dandruff is a common scalp disorder affecting almost half of the population at the post-pubertal age and of any gender and ethnicity which affects 5% of the global population. It often causes itching. It has been well established that keratinocytes play a key role in the expression and generation of immunological reactions during dandruff formation. The severity of dandruff may fluctuate with season as it often worsens in winter. As skin cells die a small amount of flaking is normal, about 487000 cells/cm<sup>2</sup> get released normally after detergent treatment. The most common fungi involved in the dandruff is *Pityrosporum Ovale*.



Currently available treatment options for the management of dandruff include therapeutic use of zinc pyrithione, salicylic acid, imidazole derivatives, glycolic acid, steroids, and sulphur and coal tar derivatives. However, these agents show certain limitations, either due to poor clinical efficacy or due to the compliance issues. Furthermore, these drugs are unable to prevent recurrence. Various Antifungal agents are widely used generally in hair shampoos for the treatment of dandruff. These products show temporary effect for span of hours in a day on the scalp. Therefore, an attempt has been made for formulation of Antidandruff hair gels which contains synthetic as well as natural anti dandruff agents which may give antidandruff action for number of hours. Number of formulations is available in the market for antidandruff therapy except gel with variety of active pharmaceutical ingredients for the treatment of dandruff. Gels are a relatively newer class of dosage form created by entrapment of large amounts of aqueous hydro alcoholic liquids in a network of colloidal solid particles, which may consists of inorganic substance, such as aluminum salts or organic polymers of natural or synthetic origins like the natural gums, tragacanth, carageenin, pectin, agar and alginic acid, semi synthetic materials such as methyl cellulose, hydroxyethyl cellulose, hydroxyl propyl methyl cellulose, and carboxymethyl cellulose, and a synthetic polymer carbopol. Clotrimazole is a synthetic antifungal and ant androgenic drug used to prevent and treat fungal skin infections likes mycetoma, eumycetoma, athlete's foot, jock itch, candidiasis, tineaversicolor especially in immune compromised patients such as those with AIDS or those on chemotherapy. Clotrimazole is sold commercially as an antidandruff shampoo, topical cream, and oral tablet. clotrimazole is effective inter matophytosis. It is also used in systemic mycosis, dermal leishmaniasiskalaazar and cushing's effect Gels are transparent to opaque semisolids containing a high ratio of solvent to gelling agent. When dispersed in an appropriate solvent, gelling agents merge or entangle to form a three dimensional colloidal network structure. This network limits fluid flow by entrapment and immobilization of solvent molecules. The network structure also responsible for the gel resistance to deformation and therefore, its visco elastic properties. Solid dispersion is the Dispersion of one or more Active ingredients in an inert carrier or matrix at Solid state prepared by the Fusion or Melting solvent method. The solubility of clotrimazole is increased by preparing solid dispersions in present studies. Herbal medicine, now a days are gaining importance for treating many diseases due to their significant effect and lesser side effects as compared to allopathic medicines. From literature survey, it was revealed that Neem preparations (*Azadirachta indica*). showed toxicity to cultures of 14 common fungi: Trichophyton. An athletes foot fungus that infects hair, skin and nails, Microsporum a., ringworm that invades hair, skin and (rarely) nails, Trichosporon a fungus of the intestinal tract, Geotrichum a yeast like fungus that causes infections of the bronchi, lungs and mucous membranes, Candida – a yeast-like fungus that is part of the normal flora but can get out of control, leading to lesions in mouth (thrush), vagina, skin, hands and lungs. Against Dandruff and Itches. It removes lice and dandruff when applied to the hair. It is therefore very effective on skin allergies, prickly heat, sweat - rashes, itches. Its antiseptic, germicidal, and effective for skin allergies, bed sores, lice, dandruff and itching. Neem has been used for treating all sorts of skin problems like acne, eczema, rosacea, psoriasis and scabies for thousands of years. Neem can be used for antifungal action therefore decided to use these plants for further study.

### Conclusion

The formulation of Anti-dandruff hair gel provides a method for treating a scalp dandruff or seborrheic dermatitis. Antidandruff hair gel containing 1.5% of Clotrimazole with Corbopol 940 base could be used as an effective in treatment of Dandruff on scalp.

### Future Aspect

**Ketoconazole:** is an imidazole derivative of wide fungicidal spectrum, which mechanism of action involves inhibition of biosynthesis of ergosterole (P-450 cytochrome) within the fungal cell wall, causing its altered permeability and consequently death of a cell. Ketoconazole displays also anti-inflammatory action through inhibition of lipooxygenase and leukotriene B4 production, as well as anti androgen action. Used topically also relieves purge and decreases intensity of skin lesions present in the course of seborrheic dermatitis, common dandruff and pityriasis versicolor. Numerous clinical trials confirmed therapeutic effectiveness of ketoconazole in





these diseases. In a randomized trial including 66 subjects effectiveness of application of shampoos containing 1% and 2% ketoconazole in treatment of severe dandruff and scalp seborrhoeic dermatitis was weighed. The trial included a few stages: period of 2 weeks before treatment, period of 4 weeks of using shampoos with 2% or 1% ketoconazole and further period of consecutive 4 weeks without therapy. Effectiveness of therapy was assessed on the basis of clinical picture, mycological tests, showing presence of *Malassezia* spp. and peeling measurements (scales measurements). Following 4 weeks of treatment shampoo containing 2% of ketoconazole proved to more efficacious than shampoo with 1% concentration. Lesser tendency to experience disorder relapses was also noted during the period of use of 2% shampoo. A multi center, randomized trial with double blind placebo controlled outlay including 575 patients has been organized, in which effectiveness of introducing a shampoo with 2% **ketoconazole** in therapy and prophylaxis of moderate and severe dandruff was assessed. Very good therapeutic results were achieved in 88% of patients. Prophylactic phase for the trial lasting for 6 months revealed disease relapse in only 23% of patients using ketoconazole, while relapse occurred in 47% of patients in the placebo group. Results proved effectiveness of using shampoo with ketoconazole 2% in the treatment and prophylaxis of relapsing dandruff. Also in Polish

**Cytostatic substances:** Substances from this group act through regulation of the excessive speed of epidermal cells division inhibiting exaggerated peeling of the scalp area, thus eliminating the scales, being the basic feature of dandruff. The above mentioned group includes: tars, selenium sulphide and piroktolamine (octopirox). These substances action is however restricted only to the period of actual use, meaning that after cessation of treatment relapses of the disease are quite often noticed. It can be explained by symptomatic only action of these formulas and lack of aetiological effect associated with insignificant influence on the population of *Malassezia furfur*. Formulas containing selenium sulphide are also recommended in the treatment of the form of dandruff (pityriasis versicolor). Selenium sulphide has a cytostatic effect on epidermal and hair follicle cells, inhibiting excessive peeling, redness and purge. It also exhibits antifungal activity – inhibits development of dermatophytes, which cause proper mycoses of epidermis, hair and nails. However, it must be remembered, that regular use of formulas containing selenium sulphide can give rise to excessive production of sebum and oily hair. Octopirox is a pyridinone derivative of a proven effectiveness in dandruff treatment, used since 1977. In recommended therapeutic shampoos preferred concentration of this substance ranges from 0.5% to 1.0%. A wide range of antibacterial and antifungal action of octopirox has been shown in *in vitro* studies. Its effectiveness and safety of therapy was confirmed in the clinical studies: in over 200 volunteers using formulas containing octopirox no signs or symptoms of irritation, allergy or other toxic reactions were observed. Octopirox formulas of 0.5% concentration are also effective in prophylaxis. In the trial by Flutterer effectiveness of the formula containing octopirox in the concentration of 0.75% was compared with placebo. After six weeks of therapy reduction of dandruff symptoms by 54.5% was achieved in subjects using octopirox and by 9.9% in subjects applying placebo. A comparative effectiveness study was performed involving shampoo containing piroktolamine 0.75% in association with 2% salicylic acid versus shampoo containing 1% zinc pyrithione. Both shampoos displayed high effectiveness against dandruff, however shampoo containing both ingredients seemed to be more efficient in eradicating symptoms of dandruff.

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