



IJCSPUB PUBLICATION (IJCSPUB.ORG)

# INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)

An International Open Access, Peer-reviewed, Refereed Journal

## A VITAL ROLE OF HERBS IN HAIR PROBLEMS: TRUE OR MYTH

Kavita Berwar<sup>1</sup>, Preeti<sup>2</sup>, Dr. Dinesh kaushik<sup>3</sup>

Department of Pharmaceutics, Hindu College of Pharmacy, Sonipat-131001, Haryana, India.

### ABSTRACT

Herbs and herbal drugs are clinically proved good for hair growth. Hair loss problem is one of great concern to both males and females and the main problems associated with hair loss are hair fading, dandruff and falling of hair. Various synthetic medicines are available for hair loss which does not treat permanently and also shows severe side effects. Herbal formulations always have activity and comparatively lesser or no side effects with synthetic. Herbal hair oils are usually easily accessible and are inexpensive. A wide variety of herbal oils have been used and newer ones are coming up every day. The main objective of this work is to develop such an herbal hair oil formulation which can resolve the problem related to hair fall and other hair diseases. This article focuses on the different types of hair oils and medicinal plants and their possible beneficial effects on the hair. This study aimed at reviewing the importance of polyherbal hair oil for the treatment of common hair problems such as alopecia, hair fall, gray hair, dryness and most common dandruff. The various herbal ingredients are used in the formulation are amla, almond, garlic, mehandi powder, neem, castor oil, arendal oil, carry leaves, coconut oil. All ingredients provide essential nutrition such as vitamin, antioxidant, proteins, terpanoids, and many essential oils to maintain normal function of sebaceous gland.

**KEYWORDS:** World health organization, Good manufacturing practice, General nutrition center, Pediculus humanus.

### INTRODUCTION

In the fields of beauty and fashion, Herbal Cosmetics are the latest craze. These agents are becoming more popular as time goes on. Most women like natural products in place of chemicals for their personal care and for increase their beauty. Herbal products give nutrients to the body and also provide satisfaction because these products are free from the synthetic chemicals. Herbal cosmetics have minimal side effects as compared to the synthetic ones.<sup>[1]</sup>

The word Cosmetic was derived from the Greek word "kosm tikos" meaning having the power, arrange, skill in decorating.<sup>[2]</sup> The term Cosmeceuticals was first used by Raymond Reed founding member of U.S. in 1961. This term was further elaborated by Dr Albert Kligman in 1984. He refers the substances that have both cosmetic and therapeutic potential.<sup>[3]</sup>

Herbal Cosmeceuticals are those cosmetic products that consist of biologically API of plant origin or combinational products of cosmetics and herbal pharmaceuticals which are intended to increase the potential of health and elegance of the dermal layer<sup>[4]</sup>.

Chemicals and synthetic ingredients used in many skincare and cosmetics products can cause a variety of undesirable side effects, especially for people with sensitive skin and potential allergic reactions.<sup>[5]</sup> In the last few years, there has been an exponential growth in the field of herbal cosmetics and they are gaining more popularity both in developing and developed countries.<sup>[6]</sup>

### ADVANTAGES

- **Natural Products-** Herbal cosmetics are natural and free from all the harmful synthetic chemicals which are toxic to the skin. In this different plant parts and its extracts are used. For e.g. Aloe vera gel and Coconut oil. They also consist of natural nutrients like vitamin E that keeps skin healthy, glowing and beautiful.
- **Safe to use-** Compared to other beauty products, natural cosmetics are safe to use. They are hypoallergenic and tested and proven by dermatologists to be safe to use anytime. No case of rashes and itching available. For e.g. Butylated Hydroxyanisole (BHA) and Butylated Hydroxytoluene (BHT) – both chemicals are synthetic antioxidants. These are used as preservatives in lipstick and moisturizers and both can cause allergic reactions to the skin. But herbal cosmetics contain natural antioxidants like Vitamin C.
- **Compatible with all skin type-** Herbal cosmetic are suitable for all skin types. No matter if you are dark or fair, you will find herbal cosmetics like foundation, eye shadow and lipstick. For e.g. Coal tar – derived colours are used extensively in cosmetics. Coal tar is recognized as a human carcinogen. But in herbal cosmetics natural colours are used which are obtained from herbs.

- **No tested on animals-** Some cosmetics are initially tested on animals to ensure that they are safe and effective to use for human use. However, natural cosmetics need not be tested on animals. These natural formulations are tested by experts in laboratories using state of the art equipment with no animals involved.
- **No side effects-** The synthetic beauty products are irritate your skin and cause pimples; they might block your pores and make your skin dry or oily. With natural cosmetics, one need not worry about these. The natural ingredients used assure no side effects one can apply them anytime. For e.g. Herbal cosmetics are free from parabens that are most widely used preservatives in cosmetics. [7]

### DISADVANTAGES

- Herbal drugs have slower effects as compare to allopathic dosage form.
- It requires long term therapy.
- They are difficult to hide taste and odour.
- Manufacturing process is time consuming and complicated.
- No pharmacopeia defines any specific procedure or ingredients to be used in any of herbal cosmetics. [8]

### Quality control of herbal drugs and cosmetics-

Several factors influence the quality of drugs are:

- Herbal drugs are a combination of several constituents.
- In most cases, the active principles are unidentified.
- Analytical methods that are suitable or standard references may not be available commercially.
- Plant actives are chemically and naturally inconstant.
- The raw materials source and quality are unstable.
- The methods of collecting, drying, storage, transportation and processing have a variable effect on the final products.

### ANATOMY AND PHYSIOLOGY OF HAIR

Human scalp hair is a bio-synthesized material that has a complex internal structure. The adult hair is around 20-180 micro meters in width and generally grows to a length of approximately 90 cm. It consists of many layers including the cuticle, the cortex and the medulla. These layers are bound together by the cell membrane complex [9].

In human, hair has various functions such as protection against external factors, producing sebum, apocrine sweat and pheromones, impact on social sexual interactions, thermoregulation and being a resource for stem cells. [10]

Hair is consisted of two distinct structures; Follicle- the living part located under the skin and hair shaft- fully keratinized non-living part above the skin surface. The arrector pili muscle, takes place between the hair bulge area and dermo epidermal junction. Hair shaft is consisted of three layers- cuticle, cortex and in certain cases medulla. Flat and square shaped cuticle cells are adhered tightly to the cortex cells proximally.

Cuticle has also important protective properties and barriers functions against physical and chemical insults. During the migration of the cells from the hair bulb to compose the cortex, the shape of them becomes more fusiform. These cells coalesce tightly and are placed parallel to the axis of the shaft. Medulla is located in the centre of the hair shaft preferably in coarser fibers. The hair medulla contains structural proteins that are markedly different from other hair keratins and eosinophilic granules that are filled by an amino acid, citrulline and eventually from internal coatings within the membranes of mature cells.

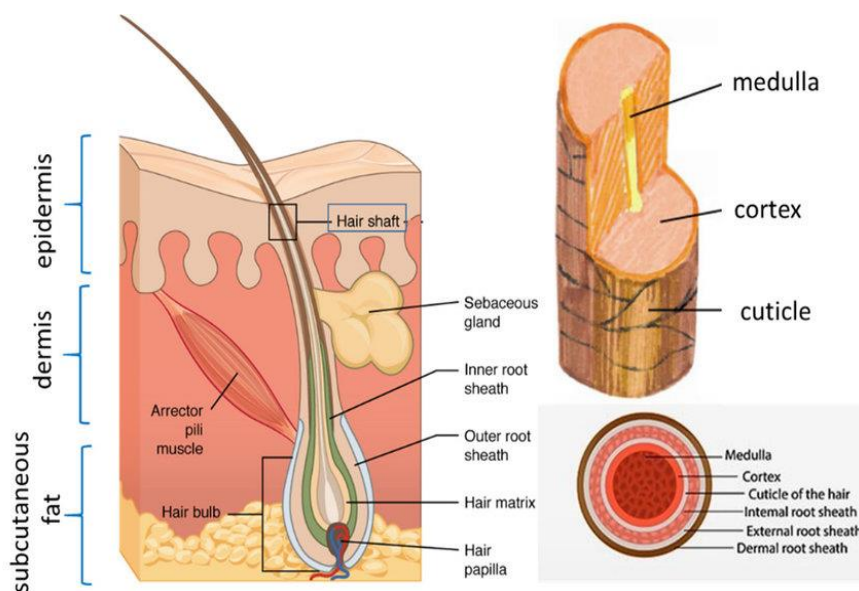
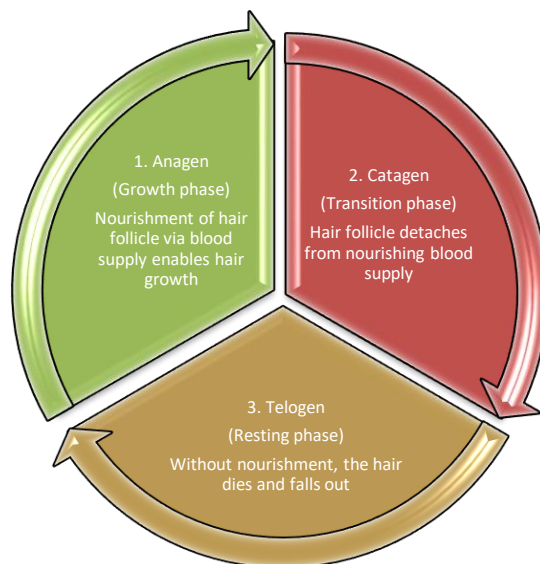


Figure 1: Structure of Hair [11]

## HAIR GROWTH CYCLE

Hair development is a continuous cyclic process and all mature follicles go through a growth cycle consisting of growth (anagen), regression (catagen), rest (telogen) and shedding (exogen) phases. The duration of the phase changes based on the location of the hair and also personal nutritional and hormonal status age.



**Figure 2: Hair growth cycle**

- Anagen phase-**The inception of anagen phase is presented by the onset of the mitotic activity in the secondary epithelial germ located between the club hair and dermal papilla in telogen hair follicle. The anagen is the active growth phase in which the follicle enlarges and takes the original shape and the hair fibre is produced. Almost 85-90 % of all scalp hairs are in anagen.
- Catagen phase-** At the end of anagen, mitotic activity of the matrix cells is diminished and the follicle enters a highly controlled involutary phase known as catagen phase. Catagen lasts approximately 2 weeks in humans, regardless of the site and follicle type. During catagen the proximal of the hair shafts is keratinized and forms the club hair, whereas the distal part of the follicles is involutes by apoptosis.
- Telogen-** The telogen stage is defined as the duration between the completion of follicular regression and the onset of the next anagen phase. Telogen stage lasts for 2-3 months. Approximately 10-15% of all hair is in telogen stage. <sup>[12]</sup>

### Problems associated with Hairs and Scalp

Scalp care is essential because it determines the health and condition of hair and prevents the diseases of scalp and hair. <sup>[13]</sup>The condition of hair plays an important role in our physical appearance and self-preparation. The quantity, quality and styling of our hair define our age, gender, health and social status. There are no significant differences in the appearance of hair appearance of hairs are due to the type of hair produced by the follicle and the type of hair care practiced by the individual. The problems associated with it includes immature graying, dandruff, lice, hairfall, baldness, frizzy hairs, splits end etc. <sup>[14]</sup>

1.	Common Problems	Dandruff Hair Loss (Alopecia) Tufted hair Folliculate Tinea Capitis (Ring worm) Canities (Premature graying of hair) Frizzy hairs (Curly hairs) Splits Ends of hair
2.	Scalp Problems	Dandruff Pediculosis (Head Lice) Scalp Psoriasis Seborrheic Dermatitis (Scalp Eczema) Cradle cap (Pityriasis capitis) Tufted hair folliculitis Lichen Planopilaris
3.	Hair Infections	Tinea Capitis (Ringworm) Tufted hair Folliculitis Trichosporonosis (White Piedra) Seborrheic Dermatitis

### DANDRUFF

Dandruff is a scalp disorder characterized by itching and abnormal and rapid turnover of the outermost layer of the human scalp. The dead skin is usually released as patches and flakes of grayish-white color. Dandruff is restricted to the scalp and involves itchy, flaking skin without visible inflammation. Three main factors encourage the formation of dandruff. They are fungal infections of the scalp, sebaceous secretion and individual sensitivity to various chemical substances. The most widely accepted microbial organism is the lipophilic yeast which belongs to the genus *Malassezia M. restrict* and *M. globosa*. <sup>[15]</sup>

The fungus *M. furfur* a lipophilic, dimorphic and yeast-like fungus, is the cause of dandruff metabolites triglycerides present in sebum by the expression of lipase, resulting in a lipid-by-product oleic acid. Penetration by oleic acid of the top of the layer of the epidermis, results in an inflammatory response in susceptible persons. [17]

There are various shampoos and scalp preparations available in the market against dandruff which contains chemicals and may cause certain side effects. The plants include several compounds which behave in a biological way against dandruff causing agents. There are many herbal shampoos available now days, which containing herbal ingredients like essential oils and extracts of plants. Many plants have beneficial effect on hair. [18]

**Table 1: Herbs with Anti-Dandruff Properties** [19]

Sino	Plant	Preparation	Possible effect on dandruff	Chemical Substances with anti-dandruff activity	Remarks
1	Punica granatum	Herbal shampoo prepared with methanol extract of flowers	Anti-malassezial effect Anti-inflammatory and anti-pruritic effect	Saponin, steroids Phenol	Punica granatum, in combination with six other medicinal plants, Rosmarinus officinal, and salvia officinalis and pirocton olamine, has shown effectiveness on dandruff removal with fewer side effects in a clinical study(31).
2	Mentha Piperita	Essential oils prepared from leaves	Inhibition of fungal growth	Flavonoids Rosmarinic acid Tannins	Commercial preparations consisting of essential oils(EO) of Mentha piperita, citrus aurantium, Lavandula, origan umvulgare, Origanum majorana, and Helichrysum italicum was reported
3	Bacopa monnieri	Crude aqueous and ethanoic extracts of leaves	Inhibition of fungal growth	Tannin phlobatannin, Saponin, Steroids,, Flavonoid, Cardiac glycosides, Phenol Alkaloids	No Clinical Studies available
4	Asparagus racemosus	Root extracts	In-vitro antifungal effects against dandruff causing yeasts <i>M. Globosa</i> and <i>M. Furfur</i> (32)	Not Established	No Clinical studies available.
5	Azadirachta indica	Leaf Extracts	Anti-pityrosporum activity	Phenols Flavonoids Nimbin	A poly-herbal hair oil containing Azadirachta indica extracts other five constituents was found to have activity against <i>P.ovale</i> in -vitro by krishnamoorthy et al.2006(33)

### HAIR LOSS (ALOPECIA)

Alopecia is the medical term for hair loss or baldness. It is a health condition in which hair lost from some or all areas of the body, usually from the scalp. Hair loss can be caused due to different reasons, such as genetic tendencies, environmental triggers, exposure to chemicals, medicines, nutritional deficiency, extreme stress or long illness etc. On the basis of hair loss pattern and causes, alopecia is classified into several categories. The two major forms **Alopecia areata** and **Androgenetic alopecia** are of main concern {20}

# Androgenetic Alopecia- Male and Female Pattern



**Figure 3: Androgenetic Alopecia** <sup>[21]</sup>

**Symptoms of Hair loss:** There are several factors for the hair loss; some of the main factors are given below.

- Hair styling products
- Hair styling techniques
- High iron deficiency
- Nutritional deficiencies
- Other fungal infections
- Poor blood circulations
- Radiation exposure
- Skin diseases<sup>[22]</sup>

Besides, a number of side effects are associated with the use of these synthetic compounds, including erythematic, scaling, purities, dermatitis, itching, etc. So to cope with the problem of Hair loss, here we have looked into the Nature's treasure and found a number of herbs with proven records for the treatment of alopecia. The herbs used in the treatment of alopecia provide one of the following:

1. Nutritional support
2. DHT blockers and 5- $\alpha$ -Reductase blockers
3. Aromatherapy and improved scalp blood <sup>[23]</sup>

1. **Nutritional support:** Minerals such as calcium, copper, chromium, iodine, zinc, and magnesium are necessary to maintain healthy hair growth. Mineral deficiency will reduce the chance to regulate the blood circulation that promotes healthy hair growth and thyroid hormones that prevent dry hair and hair loss as well as defects in hair colour. Vitamin A is important for over-all good health. It's also beneficial to hair follicles, as it keeps the hair root lubricated. Vitamin E acts as an antioxidant that aids real circulation in the scalp due to increased oxygen uptake in blood, therefore it plays an important role in promoting hair growth and preventing hair loss. Yogurt and soy, dark green vegetable, whole grain products, essential fatty acid, nuts and seedier fatty foods which are typically the best sources of vitamin E.
2. **DHT Blockers and 5- $\alpha$ -Reductase blockers 7, 8, 9, 10:** After knowing the well-established role of DHT in hair loss, it is recommended that the use of herbs that have pronounced DHT or 5- $\alpha$ -Reductase blocking activity can be used for the treatment of Alopecia (especially Androgenic). There are some herbs that have proved DHT blocking activity like Pigeon africanum, Seneroa repens, Urtica dioica and others with potential 5-  $\alpha$ -Reductase inhibiting ability like Camellia sinensis, Panax ginseng etc.
3. **Aromatherapy:** Aromatherapy can be used as a supplement to treat alopecia. It uses highly concentrated extracts which are derived from the flowers, leaves, bark and the roots of various plants like Arnica Montana, Cedrus atlantica, Lavandula agustifolia, Oscimum sanctum, Pilocarpus jabarondi, Rosmarinus officinalis, Thyme vulgaris etc., (table 2). In aromatherapy, the essential oils enter the body through the olfactory system (inhalation) and/or through your skin. As with herbs that are taken orally, the essential oils reach the circulatory system (the blood) where they bind to receptors and change the chemical composition.<sup>[24]</sup>

Table 2: Herbs Providing Nutritional Support in the Treatment of Alopecia<sup>[25]</sup>

Biological source	Family	Common name	Parts used	Chemical const.	Action
<b>Aloe barbadensis</b>	Liliaceae	Aloe Vera	Leaves	Minerals	Nutritional support
<b>Amaranthus spinosus</b>	Amaranthaceae	Bathua	Seeds, leaves	Fe, Cu, Zn	Nutritional support
<b>Avena sativa</b>	Poaceae	Wild Oats	Seeds	Carbohydrates, Fibers, Fe, Zn	Nutritional support
<b>Bacopa monniere</b>	Scrophulariaceae	Brahmi	Entire plan	Triterpenoids saponins,	Nutritional support and nerve stimulant
<b>Cajanus cajan</b>	Fabaceae	Pigeon pea	Seeds	Protein, starch & minerals	Nutritional support

**PEDICULOSIS (HEAD LICE):**

Pediculosis is an ectoparasitic infestation of human scalp. An infestation is commonly encountered in pediatric population in the age group of 6 - 12 years<sup>[26]</sup>

Figure 4: Scalp with Pediculosis<sup>[27]</sup>**Life cycle of the lice**

Their full life cycle, from egg until death, lasts a maximum of 35 days. The eggs are called nits and hatch into small insect forms - called nymphs - which then grow into adult lice. The adult lice can begin to create more eggs as soon as they hatch and the cycle begins again. First, the eggs are laid. They are firmly attached to your hair around the base of the strands. They emerge from the egg around a week later. They go through their first molt or shedding of their outer layer two days after they hatch. They get bigger with this molt. They go through their second molt three days after this and get even larger. Their third and final molt takes place 5 days later. They are now in their adult forms. The adult forms of the males and females which look slightly different from one another begin to mate and reproduce immediately. Females can keep laying eggs for the next 16 days up to 8 per day.

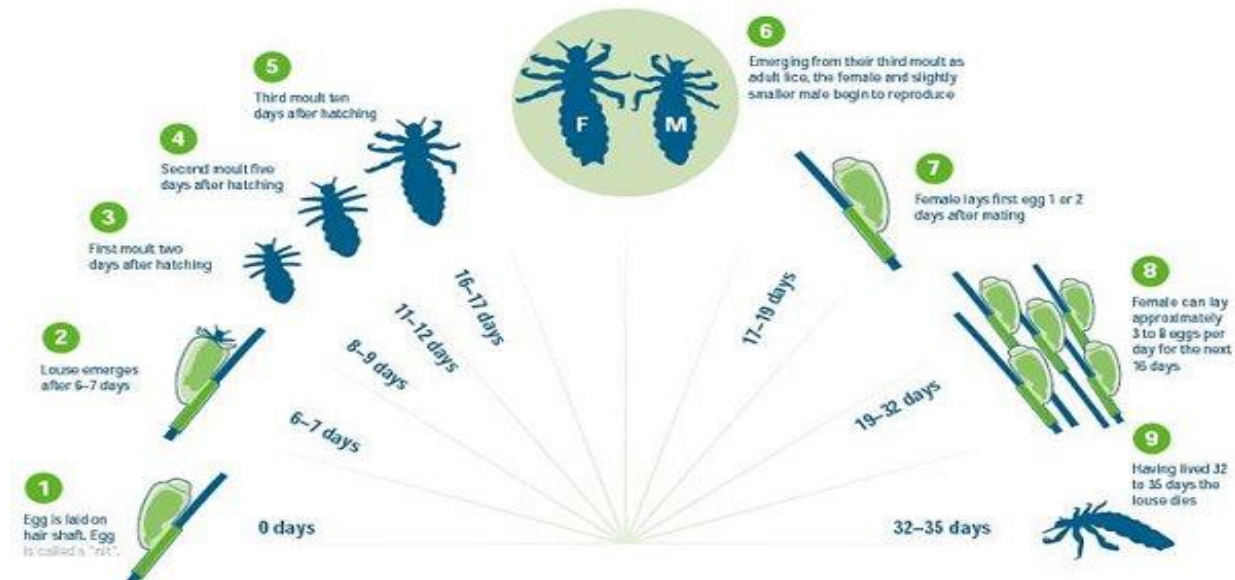


Figure: 5 Life cycles of Head Lice <sup>[28]</sup>

Table 3: Summary of plant species with documented activity against *P. h. capitates* <sup>[29]</sup>

Sr. No.	Family	Species
1	Annonaceae	Anon squamosa Cananga odorata
2	Apiaceae	Petroselinum sativum Pimpinella anisum
3	Asteraceae	Tagetes minuta
4	Cupressaceae	Juniperus oxycedrus
5	Lamiaceae	Salvia officinalis Rosmarinus officinalis
6	Lauraceae	Aniba rosaeodora Cinnamomun zeylanicum
7	Meliaceae	Azadirachta indica
8	Myrtaceae	Eucalyptus globulus Eucalyptus saligna
9	Poaceae	Syzygium aromaticum Cymbopogon nardus
10	Simaroubaceae	Quassia amara
11	Verbenaceae	Lippia multiflora

### SCALP PSORIASIS

Psoriasis is an immune-mediated, chronic, systemic inflammatory condition affecting the skin and other organ systems. In the United States, psoriasis affects approximately 7.4 million adults. Plaque psoriasis, which is the most common subtype of psoriasis accounting for about 80–90% of cases, presents as well-demarcated, erythematous plaques with micaceous scale.

The scalp is the most commonly affected region of the body in psoriasis, involved in about 80% of psoriasis cases. Psoriasis of the scalp requires special consideration due to the difficult-to-treat nature and disproportionate impact on quality of life. In addition to the physical symptoms of pain and pruritus, psoriasis, especially with involvement of the scalp, can lead to significant psychosocial impairment. Due to the presence of hair, poor accessibility, and unacceptable cosmetic appeal of topical therapy, patients also tend to have poor adherence and satisfaction with treatment. <sup>[30]</sup>



**Figure 6: Scalp Psoriasis** <sup>[31]</sup>

Psoriasis is a kind of skin condition which is said to be a type of autoimmune disease making the epidermal layer of skin to deteriorate and cause severe itching, form plaques, red scaling, and papules. It can be due to the genetic predisposition as the affected genes get involved in the control of the immune system. Psoriasis generally doesn't have a specific site, it occurs anywhere on the body including the scalp which results in the formation of plaques that causes excess scales, and its severity may result in loss of scalp hair. Scalp psoriasis tough to treat as the hair acts as a barrier for the application of topical medicines. <sup>[32]</sup>

**Table 4: Various herbs to treat skin disorder** <sup>[33]</sup>

Common Name	Family	Parts used	Useful forms	Chemical constituents	Application
Licorice	Fabaceae	Root, rhizome	Extract, oil	Glycyrrhizin	Antibacterial
Calendula	Asteraceae	Flower	Infusion	Triterpenoids, flavanoids	Softeners
Rosewood	Arecaceae	Nut	Oil	Linalool	Refreshing
Tea tree	Myrtaceae	Leaves	Oil	Terpinens, EGCG	Antioxidant
Wintergreen	Ericaceae	Fruit, leaves	Oil	Methyl salicylate, a-pinene, limonene	Anti-inflammation
Slippery elm	Ulmaceae	Leaves	Extract, seed	Flavanoids	Regeneration

Patients with psoriasis in Palestine seem to use medicinal plants as a CAM modality to manage their psoriasis. Many medicinal plants were commonly used by patients with psoriasis. More randomized clinical trials are needed to demonstrate safety and efficacy for the majority of these medicinal plants reported to be used by patients with psoriasis in Palestine.

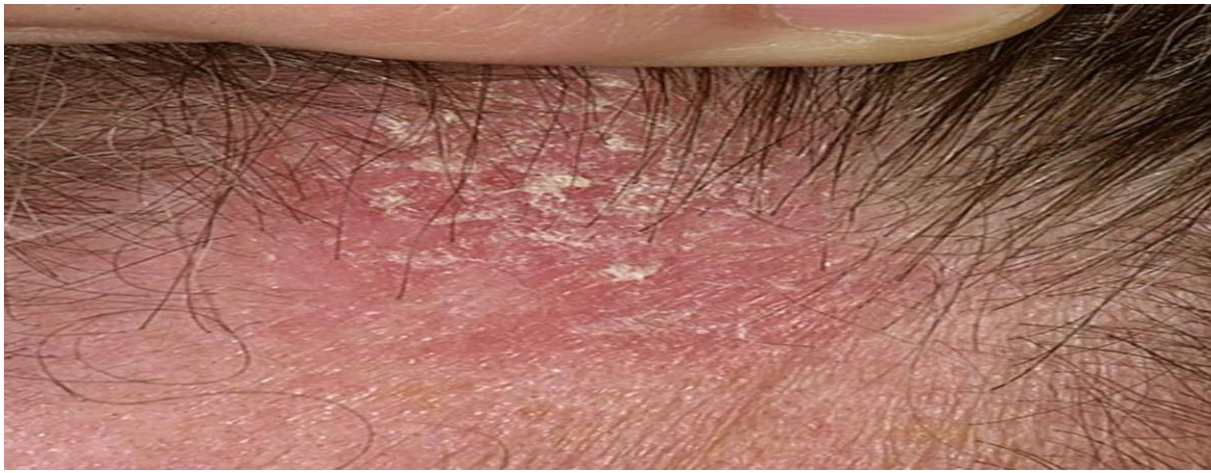
**Table 5: Most frequently reported medicinal plants by psoriasis patients in descending order by number of patients in the West Bank of Palestine<sup>[34]</sup>**

Scientific name	Common name	Family	Used parts	Method of preparation	Application
Aloe Vera	Aloe	Xanthorrhoeaceae	Leaves	Gel	Aloe leaves are grounded into gel which applied on the affected area once a day
Trigonella	Fanugreek	Leguminosae	Seeds	Paste	Grounded seeds (about 5 table spoons) are mixed with 5 table spoons of olive oil
Catharanthus	Vinca	Apocynaceae	Entire plant	Paste	Smashed vinca leaves with aloe Vera gel are mixed this paste applied on the affected area once a day.
Anthemis cotula	Chamomile	Composite	Flowers	Paste	About 50 ml of powdered chamomile flowers are mixed with 15 ml olive oil and this paste is applied 3 – 5 times daily on the affected area.
Linum usitatissimum	Flak	Linaceae	Seeds	Oil	Oil from line seeds is warmed and applied twice a day on the affected area.
Simmondsia chinensis	Jojoba	Simmondsiaceae	Seeds	Oil	Oil from seeds is applied with extensive massage on the affected area once a day.
Capsicum annum	Red pepper	Solanaceae	Fruits	Ointment	The smashed fruit is mixed with 20 gm of Vaseline and rubbed twice a day on the affected area.
Glycyrrhiza glabra	Licorice	Leguminosae	Fruits	Ointment	About 100 gm of liquorice powder is mixed with 100 ml of Vaseline and applied on the affected area twice a day.
Persea Americana	Avocado	Lauraceae	Fruits	Paste	The smashed fruit is mixed with olive oil and applied on the affected area.
Ficus carica	Fig	Moraceae	Fruits	Latex	The latex from the fruit is rubbed on the affected area once a day.
Olea europaea	Olive	Oleaceae	Fruits oil	oil	Olive oil is applied on the affected area twice a

### SEBORRHEIC DERMATITIS (SCALP ECZEMA)

Seborrheic dermatitis (SD) is a common inflammatory skin disease presenting with a papulo-squamous morphology in areas rich in sebaceous glands, particularly the scalp, face, and body folds. The infantile (ISD) and adult (ASD) variants reflect the condition's bimodal occurrence.

Infants are not usually troubled by seborrheic dermatitis, but it may cause significant parental anxiety, often appearing as firm, greasy scales on the crown and frontal regions of the scalp. It occurs in the first three months of life and is mild, self-limiting, and resolving spontaneously in most cases by the first year of life. ASD, on the other hand, is characterized by a relapsing and remitting pattern of disease and is ranked third behind atopic and contact dermatitis for its potential to impair the quality of life.<sup>[35]</sup>



**Figure 7: scalp showing seborrheic dermatitis** <sup>[36]</sup>

**Symptoms:** Scalp eczema causes patches of itchy, inflamed, dry skin. The patches may change in shape and size over time. People with seborrheic dermatitis may also have:

- Patches of waxy or oily skin
- Skin that flakes off
- Yellow or red discoloration, in people with lighter skin tones
- Skin that is darker or lighter than the surrounding area, in people with deeper skin tones

**Table 6: Plants used in Eczema** <sup>[37]</sup>

Sino.	Name of plant	Scientific name	Family	Part used and other uses
1	Aloe vera	Aloe baradensis	Lilaceae	Leaf gel used for Psoriasis (scales and itchy skin) and anti-inflammatory activity
2	Shofan	Avena sativa	Oleaceae	Colloidal oat extract have anti-itching and anti-inflammatory
3	Turmeric	Curcuma long	Zingiberaceae	Rhizome used as paste or powder
4	Chamomlie	Matricariachammolima	Asteraceae	Flower extract decoction oil
5	Oak	Quercusbranti	Fagaceae	Tannins prevent infection
6	Bakki	Vallarissolanaceae	Apocynaceae	Plant paste latex on wounds
7	Bankheera	Cucumis sativa	Curcubitaceae	Seed paste
8	Talli	Dabergia	Fabaceae	Leaves and bark mixed paste
9	Tamni	Urenalobata	Malvaceae	Whole plant paste

### TRICHOSPORONOSIS (WHITE PIEDRA)

Trichosporon spp. is yeast-like anamorphic organisms that belong to the basidiomycete's yeasts. Trichosporon species are broadly spread in nature but mostly found in areas where warm and tropical temperatures prevail. These organisms are usually found in substrates like soil; water areas like rivers, lakes, and even seawater; decomposing wood; air; foods like cheese; scarab beetles, and feces from birds, pigeons, bats, and cattle. In humans, they are occasionally found as part of gastrointestinal and oral cavity microbiota and can transiently colonize the respiratory tract, skin, and vagina.

Beigel first described the genus Trichosporon in 1865 upon discovering that it can cause a benign hair shaft infection. The absence of simple methods to distinguish among the species in the clinical microbiology laboratory led to multiple members of the genus Trichosporon being categorized together under the name T. beigelii. However, modern molecular techniques led to the discovery of several strains that are part of other fungi groups and the strain categorization of Trichosporon spp. species. Currently, more than 50 different subspecies and around 16 different strains cause human disease.

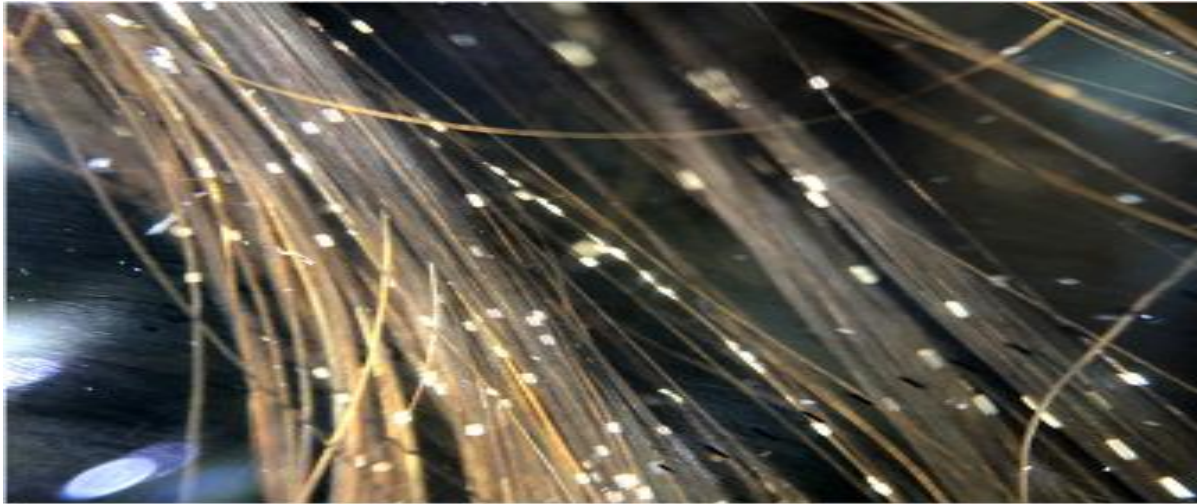
Although most *Trichosporon* spp. has been cultivated in laboratories, the fungus is now an agent of opportunistic infections, mostly seen in immunocompromised patients.

### PATHOPHYSIOLOGY

*Trichosporon* spp. can cause two types of infection: superficial and systemic, and both presentations can lead to hypersensitivity pneumonia.

**Invasive Infection:** Invasive infection occurs in three forms: disseminated disease (which is the most common presentation), disease localized to major organs, and infections that do not affect the tissues but are related to catheters. *Trichosporon* spp. has virulence factors that allow its growth and permit the establishment of the disease and its dissemination within the host. It has the ability to adhere to and form bio films on implanted devices. Antibiotics may also increase the incidence and extent of colonization and may play a role in increasing the risk of human infections. [38]

**White Piedra:** White piedra is a superficial fungal infection of hair caused by *Trichosporon* species. It presents clinically as white nodules encasing the hair shafts and may lead to increased fragility. It can usually be differentiated easily from clinically similar conditions based on clinical and microbiologic features. The Spanish word “pier” means stone and justifies its usage to denote conditions characterized by presence of hard nodules along the hair shaft, namely white and black pier. These two are distinguishable clinically, based on the color and consistency of nodules, their anatomic localization, and fragility of hair. [39]



**Figure 8: Scalp showing White Piedra** [40]

The fungus *Trichosporon ovoides* which is involved in causing both types of Piedras is found in soil, lake water and plants and can occasionally be seen as normal flora of the human skin and mouth.

**Table 7: Inhibitory effect of essential oils against *Trichosporon ovoides* causing Piedra Hair Infection** [41]

Botanical names	Local name	Family	Parts used
<i>Jeniperus communis</i>	Juniper	Cupressaceae	Berries and Twig
<i>Commiphora myrrha</i>	Myrrh	Burseraceae	Gum, resin, sap
<i>Zingiber officinalis</i>	Ginger	Zingiberaceae	Root & rhizome
<i>Boswellia carterii</i>	Frankincense	Burseraceae	Resin
<i>Eucalyptus globulus</i>	Eucalyptus	Myrtaceae	Leaves, fruit, sap
<i>Citrus aurantifolia</i>	Lime	Rutaceae	Leaves, fruit & peel
<i>Citrus aurantium</i>	Orange	Rutaceae	Fruit & peel
<i>Cinnamomum zeylanicum</i>	Cinnamon	Lauraceae	Barks, leaves
<i>Cedrus atlantica</i>	Cedarwood	Pinaceae	Twig & leaf
<i>Citrus lemon</i>	Lemon	Rutaceae	Fruit, peel, leaf
<i>Melaleuca alternifolia</i>	Teatree	Myrtaceae	Leaves
<i>Cyperus scariosus</i>	Nagarmotha	Cyperaceae	Roots
<i>Jasminum officinale</i>	Jasmine	Oleaceae	Flower
<i>Pogostemon graveolens</i>	Geranium	Geraniaceae	Leaves and flowers

## LICHEN PLANOPILARIS

Lichen planus is a relatively common disorder, estimated to affect 0.5% to 2.0% of the general population. It is a chronic inflammatory disease affecting mucosal and cutaneous tissue. [42]

Although the pathogenesis is not fully understood, the T-cell-mediated destruction of the hair follicles seems to suggest an underlying autoimmune etiology. [43]

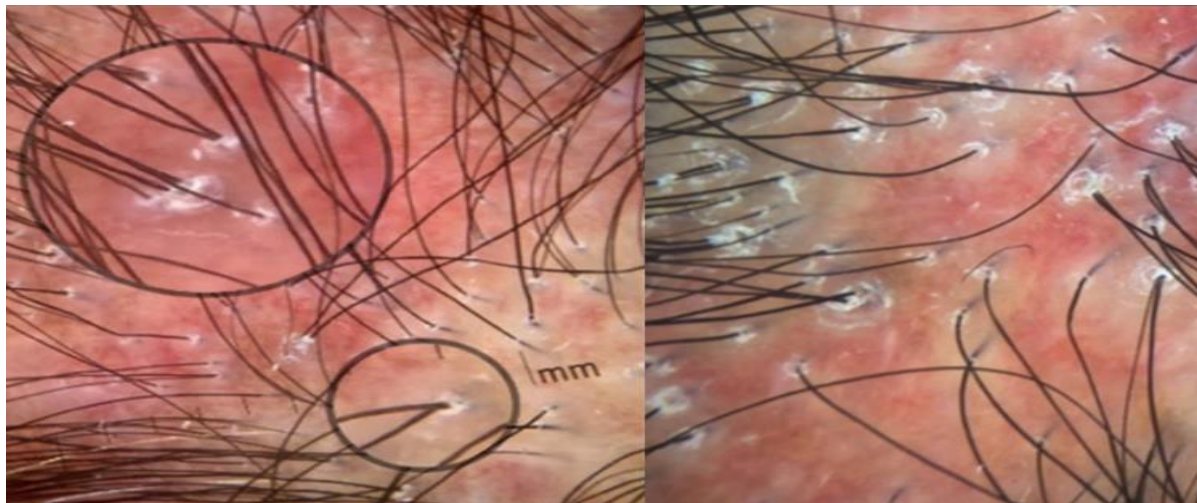


Figure 9: Scalp showing lichen planopilaris [44]

Table 8: Lichen planopilaris (LPP)-relevant properties of various Gashee components [45]

Generic name	INCI name	Properties
Turmeric	Curcuma longa (curcumin)	<ol style="list-style-type: none"> <li>1. Inhibits JAK/STAT signaling pathway through inhibition of STAT phosphorylation, thus enhancing anti-inflammatory cytokine levels suppresses activation of DCs to restore immunologic balance.</li> <li>2. Possesses potent antifibrotic properties by blocking the profibrotic actions of TGF-<math>\beta</math> through down regulation of the Smad signaling pathway, its derivative, THC, is potent in up regulating PPAR-<math>\gamma</math>.</li> </ol>
Fenugreek	Trigonella foenumgraecum	<ol style="list-style-type: none"> <li>1. Inhibits JAK/STAT signaling pathway through major steroidal sapogenin in fenugreek seed, diosgenin; suppresses JAK1 and JAK2 and increases SH-PTP2 expression, which thus inhibits STAT3 activation.</li> <li>2. Diosgenin possesses antifibrotic properties by inhibiting the TGF-<math>\beta</math>1/Smad signaling pathway; it up regulates PPAR-<math>\gamma</math> expression.</li> </ol>
Green tea	Camellia sinensis	<ol style="list-style-type: none"> <li>1. Inhibits JAK/STAT signaling pathway through inactivation of positive regulators JAK1 and JAK2, which are upstream activators of STAT1; activation of negative regulator SHP-2.</li> <li>2. Up regulation of PPAR-<math>\gamma</math> expression through activation of luciferase reporter driven by PPAR-responsive elements.</li> </ol>

## CRADLE CAP (PITYRIASIS CAPITIS)

Cradle cap, or pityriasis capitis, is a subset of infantile seborrheic dermatitis (ISD). It is a very common, mostly self-limiting, chronic non-inflammatory scaling skin condition that presents between the third week and first couple months of life. The peak incidence is at 3 months of life. This activity reviews the evaluation, treatment, and complications of cradle cap and underscores the importance of inter professional team approach to its management. [46]



Figure 10: Baby Cradle Cap <sup>[47]</sup>

**Path physiology:** Cradle cap classically presents as greasy, non-inflammatory plaques with overlying yellowish scale, on the vertex and frontal regions of the scalp. Cradle cap is usually asymptomatic; neither painful nor pruritic. Most infants generally have no side effects from the condition with feeding and sleep not being interrupted. Studies have shown that infants with cradle cap commonly have a family member with either atopic dermatitis and/or asthma. <sup>[48]</sup>

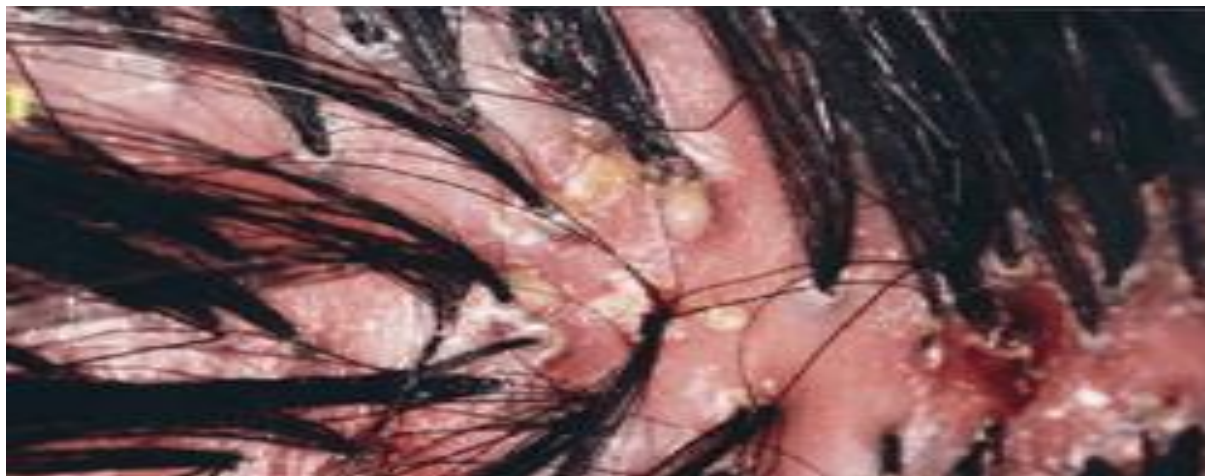
Table 9: Easy & Effective Natural Remedies to Treat Cradle Cap in Infants <sup>[49]</sup>

Sr. no	Name	Description
1.	Coconut Oil	Coconut oil has always been used as an <b>antifungal</b> and <b>antibacterial</b> agent for small bruises. It is very effective in countering the infections occurring in babies with cradle cap. It is very easily available and also functions as a good moisturizer to the scalp.
2.	Apple Cider Vinegar	Apple cider vinegar works by <b>reducing the dryness</b> of the scalp. Mix two portions of apple cider vinegar with one portion of water to dilute it. Apply this mixture on the scalp and leave it for about fifteen minutes. Wash off the liquid from the hair with warm water and repeat it twice in a week. Make sure it does not get into the baby's eyes.
3.	Olive Oil	Olive oil is one of the best oils especially for the skin as it contains a <b>vitamin E</b> . The vitamin E in olive oil nurtures the skin and protects it from infections. Apply a few teaspoons of olive oil and gently massage the scalp with it. Let it rest for a few hours or even overnight and rinse off with a mild shampoo to get a nourished scalp. It is one of the best natural remedies for cradle cap in infants.
4.	Tea Tree Oil	Tea tree oil available in select drug stores is a popular <b>anti-acne</b> medicine used by adults. Using the same principle, it works for cradle cap in babies also, by controlling the excess secretion of oil glands. To use tea tree oil, mix it in the ratio of 1:10 with almond oil and use the diluted tea tree oil on the scalp by gently massaging it. Leave it for absorption for about twenty minutes and wash it off with baby shampoo.
5.	Vegetable Oil	Any vegetable or mineral oil available in the market is also a good remedy for cradle cap. It can be used to <b>the skin</b> of the baby and loosen the scale formation. It can be applied and left for about two hours for soaking, before washing with safe baby shampoo.
7.	Almond Oil	Almond oil is important oil that is rich in <b>vitamin E</b> . It is generally suggested as a home remedy for healthy skin, and it works very well for cradle cap too. Almond oil should be applied to the infected sections of the scalp and massaged. After allowing it to act for some time, you can wipe it off with a wet cotton cloth.
8.	Aloe Vera	Aloe Vera has a cooling effect on the body and is incorporated in many medicinal preparations used for skin infections. Aloe vera gel can be freshly prepared from the cuttings of a plant and processed to apply on the head. Due to its cooling effect, it must be used with caution on babies. The gel can be left on for a few minutes to ease the inflammation.

## TUFTED HAIR FOLLICULITIS

Tufted hair folliculitis is a rare folliculitis of the scalp that resolves with patches of scarring alopecia within multiple hair tufts emerging from dilated follicular orifices. Tufting of hair is caused by clustering of adjacent follicular units due to a fibrosing process and to retention of telogen hairs within a dilated follicular orifice. Various pathogenetic mechanisms have been proposed including nevroid abnormalities, recurrent infections of the follicles, and retention of telogen hair in the tufts.<sup>[50]</sup>

**Pathophysiology:** Most commonly, infection of the hair follicle is the mechanism behind most folliculitis cases. Even so, folliculitis may also result from fungal or viral infections, but this does not mean that all folliculitis cases are infectious. Sometimes, folliculitis may be the result of inflammation secondary to ingrown hairs as well as caused by certain drugs such as lithium and cyclosporine.<sup>[51]</sup>



**Figure 11: Tufted hair folliculitis**<sup>[52]</sup>

folliculitis is generally the result of an infection in a damaged hair follicle. Infection by *Staphylococcus aureus* bacteria, yeast, fungus and viruses can also cause folliculitis.

**Table 10 Essential oils to treat and prevent mild folliculitis**<sup>[53]</sup>

Sr. no.	Oil	Description
1	Tea tree oil	Tea tree oil can be added to your shampoo, lotion or body wash. Rub it gently onto the affected area and let it sit. Before using it do a patch test to make sure there are no adverse reactions. Tea tree oil is especially effective for people with recurring folliculitis.
2	Geranium oil	Tea tree oil can be mixed with geranium oil and grapefruit seed oil.
3	Neem oil	Neem oil is a powerful antiseptic, antifungal agent, it also prevents the formation of scars and is very effective for skin and scalp irritation. Mixed some neem oil with coconut oil or almond oil.

## TINEA CAPITIS (RINGWORM)

Tinea capitis, also known as ringworm of the scalp, refers to a fungal infection of the scalp, eyelashes, and eyebrows, most often caused by any of the dermatophytes belonging to two genera *Trichophyton* and *Microsporum*. The main causative agents are *Trichophyton tonsurans* and *Microsporum canis*. Tinea capitis often presents with pruritic, scaling areas of alopecia. Tinea capitis is the most common dermatophyte infection in children worldwide.<sup>[54]</sup>

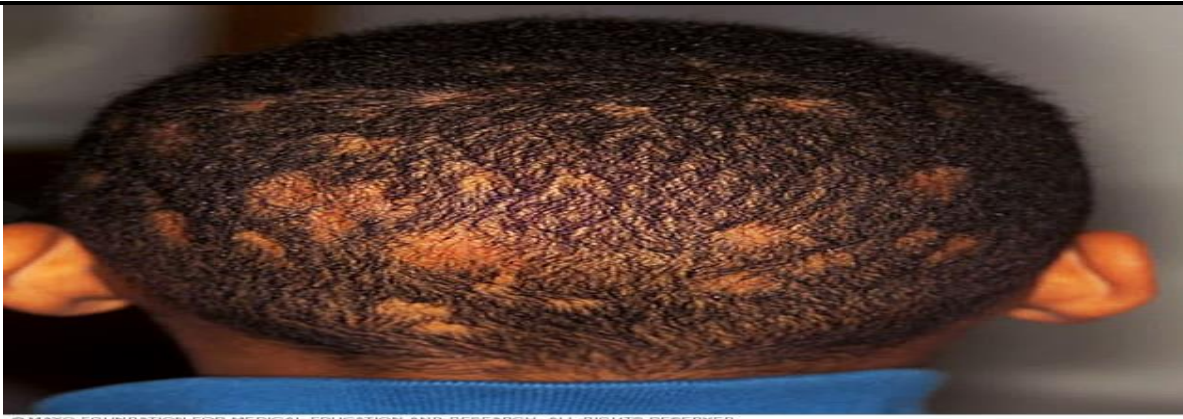


Figure 12: Ringworm of the scalp<sup>[55]</sup>

### Clinical Features

The clinical appearance of ringworm of the scalp is variable, depending on the type of hair invasion, the level of host resistance and the degree of inflammatory host response. Most affected patients are children for 6 months to 10–12 years of age. Tinea capitis can sometimes occur in adults and in this case is usually caused by anthropophilic fungi.<sup>[56]</sup>

Table 11: Home remedies for scalp ringworm<sup>[57]</sup>

Sr. no	Preparation name	Description
1	Apple cider vinegar	Apple cider vinegar has strong antifungal properties, so it may help treat ringworm when applied topically to the affected area. To use it, soak a cotton ball in undiluted apple cider vinegar and brush the cotton ball over your skin. Do this three times per day.
2	Tea tree oil	Native Australians conventionally used tea tree oil as an antifungal and antibacterial, and it's used today for the same purposes. It can be extremely effective in treating fungal skin infections.
3	Coconut oil	Coconut oil has both microbial and antifungal properties that can help treat ringworm infections. It's an extremely effective topical home remedy for ringworm and infections with other fungi, like candida. To use it, warm the coconut oil either in the microwave or in your hand until it becomes liquid, then apply it directly to the affected area. It will absorb into the skin quickly. Apply it at least three times daily.
4	Turmeric	Turmeric has numerous health benefits, including antibacterial and anti-inflammatory properties. It's also an effective antifungal that inhibits growth.
5	Aloe vera	Aloe vera has long been used as a natural remedy for both bacterial and fungal infections, and ringworm is no exception. Aloe vera can treat the ringworm and may soothe symptoms of itchiness, inflammation, and discomfort.

### CANITIES (PREMATURE GRAYING OF HAIR)

Premature graying of hair (PGH) is defined as graying of hair before the age of 20 years in Caucasians and before 30 years in African American population. It can severely affect the self-esteem of an individual. The exact etiopathogenesis remains unknown, although it has been associated with premature aging disorders, atopy, and autoimmune diseases.

Patients, who present with PGH, should be assessed for syndromes and metabolism diseases. Hair dyes remain the main modality of the treatment for cosmetic concerns after nutritional supplementation. Graying of hair also called canities or achromotrichia occurs with normal aging. However, the age at which it occurs varies in different races. PGH is defined as graying of hair before the age of 20 years in Caucasians and before 30 years in Blacks.<sup>[58]</sup>



**Figure 13: Canitis (Premature greying)** <sup>[59]</sup>

**Pathogenesis of gray hair:** Physiological or senile canities is thought to occur due to depletion of the regenerative capacity of hair pigment cells. On average, a hair bulb undergoes  $7 \pm 15$  cycles of melanocyte replenishment from the ORS reservoir till the age of 40–45 years after which the regenerative capacity is lost leading to hair graying.

Dysregulation of antioxidant mechanisms in hair follicles also seems to play an instrumental role in increasing the oxidative stress. Non pigmented hair follicles have a suppressed catalase activity and decreased ferric reducing capacity. Patients with PHG have high oxidative stress in the hair follicle as well as in the serum, which may explain the association of PHG with coronary heart diseases. <sup>[60]</sup>

**Table 12: Essential oils for gray hairs** <sup>[61]</sup>

Sr. no.	Essential oils	Description	How to use
1	Tea Tree oil	Tea Tree consists of antibacterial and anti-microbial factors. It also carries strong properties of cleansing. Apart from being an essential oil for preventing grey hair, it can prevent dandruff and make your hair long and lustrous too.	The appropriate proportion is to mix ten drops of the oil with your regular shampoo or conditioner for daily use. Or. You may put three drops of the tree tea essential oil with carrier oil and put it in your hair for about an hour ago before rinsing it off.
2	Orange Essential Oil	Orange, being a citrus fruit, is rich in vitamin C. Along with preventing greying hair; it promotes better hair growth, makes the hair follicles strong, and therefore, stops your hair from breaking off. Orange essential oil is also effective for preventing dandruff.	It would be best to mix a couple of drops of the orange essential oil with your daily shampoo or conditioner as you prefer and wash your hair with the mixture. Otherwise, you may apply the oil along with your regular hair oil and keep it for at least 15 minutes before rinsing it.
3	Lavender Oil	The first thing that will make you wonder about this oil is its ambrosial fragrance. However, apart from its aroma, Lavender essential oil is undoubtedly the best essential oil for grey hair as it is popularly in use for grey hair therapies. Additionally, the Lavender essential oil also carries out the function of darkening your hair.	For applying this essential oil, you have to mix several drops into olive oil, coconut oil, or any other carrier oil. Then, apply it on your scalp directly and leave it for at least 10 minutes before washing your hair or shampooing. You may make this your routine for several weeks.
4	Rosemary Essential Oil	Rosemary is an essential component in the treatment of hair growth. Rosemary	Mix several drops of this essential oil with either coconut or olive oil. Leave it

		essential oil prevents greying of hair and also darkens the hair that has already turned grey. Moreover, it doesn't even cause much irritation and itching on the scalp after the treatment.	for one to two hours (or you can apply this mixture twice a week before going to bed) before you go for shampooing. Repeat the routine twice every week for the best results.
5	Ginger Essential Oil	Ginger is one of the most common components for hair growth shampoos and oils. Also, it works wonders when you have to prevent greying of your hair. Ginger Essential oil is go to oil for your scalp. It prevents your hair from turning gray and keeps your scalp nourished with a heavier and darker look.	To apply it, mix several drops of the Ginger essential oil with your regular hair oil and massage it on your scalp. Leave it for one to two hours (or you can apply this mixture twice a week before going to bed) and then, wash your hair with your regular shampoo and conditioner.

### FRIZZY HAIRS (CURLY HAIRS)

“Frizzy hair is the effect of different individual hair fibers running in multiple directions, which is why frizzy hair has a rough feel to it. As a result, hair appears dry and frizzy instead of smooth and defined,” explains Sean Steigerwald, Head R&D Scientist at Kao USA Inc. Frizzy hair can be especially troublesome for those with both thick and frizzy hair, but certain haircuts can help reduce frizz and tame your mane.

Frizzy hair happens when the cuticle layer of your hair is raised, which allows moisture to pass through and swell the strands. But what is the cuticle layer? The cuticle layer refers to the outermost layer of the hair strand that protects the innermost layers of the hair shaft.

If you look at the cuticle layer underneath a microscope, it looks like shingles on a roof. Steigerwald explains that “hair is made up of several different layers of keratin protein, the cuticle (external layer) and the inner layers known as the cortex and medulla.” These layers make-up the unique characteristics of your hair and how it behaves. When the cuticle layer is properly sealed, it can retain moisture in the hair shaft longer, making your hair less prone to frizz.<sup>[62]</sup>



Figure 14: Frizzy hairs<sup>[63]</sup>

Curly hair can be prone to frizz, but certain hairstyles work to tame frizz and define your beautiful, curly hair. Lastly, Steigerwald tells us that, “the amount of damage to the hair leads to frizz. For instance, split ends, cuticle loss and breakage gives hair that frizzy look because the hair fibers aren't uniform or aligned.”<sup>[64]</sup>

Table 13: Essential oils for frizzy hairs<sup>[65]</sup>

Sr. no.	Essential oils	Description
1	Lavender oil	Lavender essential oil promotes the formation of more hair follicles, which helps increase the thickness and growth of hair. It also conditions hair fibers while treating the dryness and friskiness in the hair. This oil can easily be used as a leave-in conditioner because of its hair nourishing qualities. Applying Lavender oil on dry and frizzy hair can effectively benefit the hair cuticles by locking them up with moisture. It also enhances the overall hair strength and prevents split-ends as well as dry-ends. The beautiful aroma of Lavender Essential Oil also provides you with tranquillity thereby, improving sleep.
2	Argon oil	Argon oil is high in nutrients such as Vitamin E and fatty acids, therefore it is also known as "liquid gold." It helps to soften dry and frizzy hair. Pure argon oil can repair even the roughest and coarse hair by trapping in the moisture and making hair glossy and smooth. This oil can easily permeate the hair, leaving it silky and manageable. It's a very common ingredient in hair masks and conditioners that smoothen the hair, and it also conditions and nourishes the hair that has become dry and frizzy due to excessive style and heat.
3	Coconut oil	Coconut oil contains a lot of vitamins, minerals, and other nutrients. The oil is recognized for its ability to hydrate and protect your hair, and it also helps prevent split ends and flyaways in your hair. Vitamins A, C, and E are present and aid cell reproduction, tissue repair, and hair development. Regular application of coconut oil is also proven to increase hair suppleness, and it gives luster to your hair and is also beneficial for treating sensitive and itchy scalp. Coconut oil's antioxidant ingredients assist in protecting your hair from the damaging effects of the sun.
4	Olive oil	Olive oil is one of the finest remedies for frizzy hair, and it swiftly removes frizz and provides luster to the hair. Olive oil is a good source of vitamin A, which protects hair dullness and dryness by locking in moisture. Olive oil has long been utilized for topical treatment on hair due to its emollient characteristics. To prevent friction, it leaves a thin layer on the hair strands, and it also prevents hair from drying out and increases the luster and vitality of your hair.
5	Castor oil	Castor oil is rich in fatty acids and ricinoleic acid, which help in smoothing the hair cuticle, softening coarse hair, and reducing frizz. The natural moisture content in this oil leaves hair soft and silky. By applying castor oil to the hair, your hair will feel replenished and nourished.  Since Castor oil has rich emollient properties, it provides insane benefits for wavy hair since it helps maintain a tight and firm texture of frizzy hair. Several studies show that this oil can also help with hair growth and nourishment.

### SPLITS ENDS

Split ends are exactly what they sound like - hair that's been naturally split at the ends (which is the oldest part of the hair shaft) due to damage. It's important to note though that split hair can occur all over your head, not just your ends. Some of the most common split ends causes include the following:



Figure 15: Splits ends of hairs <sup>[67]</sup>

Table 14: Essential oils for splits ends and breakage <sup>[68]</sup>

Sr. no.	Essential oils	Description	How to use
1	Lavender Oil	It can be used to improve the overall health of your hair. Regular application of Lavender oil for hair ensures shiny, thick, and healthy-looking strands that can withstand many environmental damages. Its antimicrobial properties will not allow the formation of fungi or any bacteria, thus keeping dandruff away.	When added with jojoba oil, lavender oil works great on split ends and can promote hair growth. Mixed with water, or a blend of your choosing, lavender oil can also help to control and maintain frizzy hair without having to use chemical-based hair care products.
2	Basil Essential Oil	Basil is an age-old sacred ingredient of India. Massaging basil oil improves scalp circulation that stimulates hair follicles and promotes the production of new healthy hair all over again. Not only this, it also provides hydration and softens your tresses.	Mix a few drops of Basil essential oil with coconut or avocado oil and massage it into your hair. Other oils such as, Rosemary and Lavender in combination with basil oil can do miracles to the hair.
3	Tea Tree Oil	Tea tree oil strengthens your hair and prevents damage from frizz, dandruff, loose ends and split ends. Massaging with tea tree oil will not only moisturize and soothe the dry itchy scalp but at the same time control excess oil production that can block hair follicles, preventing hair growth.	Mix it with any carrier oil like coconut, almond oil or olive oil and massage it for 8-10 minutes onto the scalp to increase blood flow. Wash it with your favourite shampoo and conditioner. You can also use tea tree oil for daily cleansing, just mix a few drops of it with your normal amount of shampoo. Leave on for five minutes and then rinse thoroughly.
4	Cedarwood Oil	Cedarwood essential oil is thought to promote hair growth and reduce hair loss by balancing the oil-producing glands in the scalp. When used regularly, this oil will help make your hair stronger, prevent frizz, and even repair split ends.	Mix a few drops of cedar wood essential oil with any carrier oil of your choice. Massage it into your scalp, and leave it on for 10 minutes before washing it out.
5	Eucalyptus Oil	Eucalyptus oil is an excellent essential oil that has soothing properties when it comes to your scalp. This oil enhances hair elasticity, preventing split ends and hair breakage. It also has antimicrobial and anti-fungal properties that keep the scalp clean and prevent fungal infections	Mix 2-3 drops of eucalyptus essential oil with any carrier oil of your choice. Massage it into your scalp for 5-7 minutes so that every strand absorbs the oil better, and leave it on for 30-60 minutes before washing it.

## REFERENCES

1. Joshi S Lakshmi, Pawar A Harshal, Herbal cosmetics and Cosmeceuticals: An overview, Natural products chemistry research, edition 2015; 3(2) p-1.
2. Fathima A, Varna Suit, Jagannath P, Akashi M, General review on herbal cosmetics, International Journal of drug formulation and research, edition 2011; 2(5) p-140.
3. Dangare N Prajakta, Bakal L Ravindra, Ajmire V Prashant, Patinge A Prerna, More P Manisha, Manwar V Jagdish, An overview on herbal cosmetics and cosmeceuticals, International journal of pharmaceutical sciences review research, edition 2021; 68(1) p-75.
4. Tatiya AU, Gokhale SB, Surana SJ, Gokhale Alpana, Herbal cosmeceuticals-1, Niral publication – advancement of knowledge.
5. Patkar B Kunda, Herbal cosmetics in ancient India, Indian journal of plastic surgery, edition 2008; 41 p-S134, S135.
6. Emerald M, Emerald A, Emerald L, Kumar Vikas, Perspective of natural products in skin care, Pharmacy and Pharmacology International journal, edition 2016; 4(3) p-1.
7. Joshi S Lakshmi, Pawar A Harshal, Herbal cosmetics and cosmeceuticals: An overview, Natural products chemistry research, edition 2015; 3(2) p-1-2.
8. www.slideshare.net/tonykannala/herbalcosmetic-42357442
9. KD Sindhura, Jain Vikash, Challenges in formulating herbal cosmetics, International journal of applied pharmaceuticals, edition 2018; 10(6) p-48.
10. Yang chi – fei, Zhang Yuchen, Rheinstadter C Maikel, The structure of people’s hair, Peer Journal, Edition 2014; 2(14).
11. Morganti Pierfrancesco, Morganti Gianluca, Coltelli Beatrice Maria, Smart and sustainable hair products based in chitin-derived compounds, cosmetic, edition 2021; 8(20) p-5.
12. Erdogan Bilgen, Anatomy and physiology of hair, Hair and scalp disorders, edition 2017, p-3-4.
13. Nayak Satheesha B, Ann Yuet Chua, Ling Su Chan Emily, Aitchal Ashwini P, et. al, A study on scalp hair health and hair care practices among Malaysian medical students, International Journal of Trichology, edition 2017; 9(2) p-58.
14. Trueb M Ralph, Henry P Jim, Davis G Mike, Schwartz R Jim, Scalp condition impacts hair growth and retention via oxidative stress, International Journal of Trichology, edition 2018; 10(6) p-2.
15. KR Keragala, SK Kempitiya, K Kumara, NN Kumarapeli, DT Kasunsiri, SS Gunathilaka, A review on potential herbal treatments for dandruff – the embarrassing scalp disorder, Anuradhapura medical journal, edition 2020; 14(1) p-22.
16. www.vanicream.com/skin-basics/know-dry-scalp-sensitive-skin-dandruff-seborrheic-dermatitis.
17. Mehta Kushboo, Mohanvel Kannappan Sucharitha, Rajasekharan Kumar Satish, Kandhari Trishna, Thambidurai Yuvarani, Extraction of antidandruff compound from lawsonia inermis, Research journal of pharmaceutical, biological and chemical sciences, edition 2017; 8(4) p-1208.
18. Pal S Rashmi, Saraswat Nikita, Wal Pranay, Wal Ankita, Pal Yogendra, Preparation and assessment of poly-herbal anti-dandruff formulation, The open dermatology journal, edition 2020; 14(23) p-22.
19. KR Keragala, SK Kempitiya, K Kumara, NN Kumarapeli, DT Kasunsiri, SS Gunathilaka, A review on potential herbal treatments for dandruff – the embarrassing scalp disorder, Anuradhapura medical journal, edition 2020; 14(1) p-24-25.
20. Kaushik R, Gupta D, Yadav R, Alopecia: Herbal remedies, International journal of pharmaceutical sciences and research, edition 2011; 2(7) p-1631.
21. <https://www.linkedin.com/pulse/androgenetic-alopecia-dr-anupriya-goel/>
22. Pundkar S Ashwini, Murkute M Prachi, Wani Snehal, Tathe Mohini, A review: Herbal therapy used in hair loss, Pharmaceutical Resonance, edition; 2020 3(1) p-45.
23. Kaushik R, Gupta D, Yadav R, Alopecia: Herbal remedies, International journal of pharmaceutical sciences and research, edition 2011; 2(7) p-1631.
24. Pundkar S Ashwini, Murkute M Prachi, Wani Snehal, Tathe Mohini, A review: Herbal therapy used in hair loss, Pharmaceutical Resonance, edition; 2020 3(1) p-46.
25. Kaushik R, Gupta D, Yadav R, Alopecia: Herbal remedies, International journal of pharmaceutical sciences and research, edition 2011; 2(7) p-1633.
26. Madke Bhusan, Khopkar Uday, Pediculosis Capitis: An update, International Journal of Dermatology, Venereology and Leprology, edition 2012; 78(4) p-429.
27. <https://www.businessmodulehub.com/blog/the-general-and-effective-treatments-that-can-be-used-to-treat-the-problem-of-hair-lice-naturally/>
28. [https://kumeyaay.sandiegounified.org/about/policies/life\\_cycle\\_of\\_lice](https://kumeyaay.sandiegounified.org/about/policies/life_cycle_of_lice)
29. Rossini Carmen, Castillo Lucia, Gonzalez Andres, Plant extracts and their components as potential control agents against human head lice, Phytochemistry reviews, edition 2008; 7 p-55.
30. Mosca Megan, Hong Julie, Hader Edward, et al, Scalp Psoriasis: A literature review of effective therapies and updated recommendation for practical management, Dermatology and Therapy (Heidelb), edition; 2021 11(3) p-770.
31. <https://www.everydayhealth.com/psoriasis/guide/scalp-psoriasis/>
32. Venkatesh P M, Uday Govind, Recent developments in the treatment of scalp psoriasis: A review, International Journal of Pharmaceutical Sciences and Research, edition 2019; 10 (1) p-29.
33. Aghmiuni Izadyari Azedeh, Khiavi Akbarzadeh Azim, Medicinal plants to calm and treat psoriasis disease, Aromatic and Medicinal plants – Back to nature, edition 2017; 10 p-15.
34. Shawahna Ramzi, Jaradat Amin Nidal, Ethanopharmacological survey of medicinal plants used by patients with psoriasis in the west bank of Palestine, BMC Complementary and Alternative Medicine, edition 2017; 17 p-1,5,6.

35. Tucker Dan, Masood Sadia, Seborrheic Dermatitis, National Library of Medicine, National Center for Biotechnology Information, edition 2022; p-1,2.
36. <https://discover.hubpages.com/health/Seborrheic-Dermatitis-Pictures-on-Face-Scalp-Hair-loss-Causes-Treatment>
37. Nigam P K, Adverse reactions to cosmetics and methods of testing, Indian Journal Dermatology, Venereology and Leprology, edition Jan-feb 2009; 75(1): 10-19.
38. Castano Gabriel, Yarrarapu S Naga Siva, Mada Kumar Pradeep, Trichosporonosis, National Library of Medicine, National Center for Biotechnology Information, edition 2022; p-1,2.
39. Gaurav Vishal, Grover Chander, Das Shukla, Rai Gargi, White Piedra: An uncommon superficial fungal infection of hair, Skin Appendage Disord, edition 2022; 8(10) p-34.
40. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/piedra>
41. Saxena Seema, Uniyal Veena, Bhatt R.P, Inhibitory effects of essential oils against Trichosporon Ovoids causing Piedra hair infection, Brazilian Journal of Microbiology, edition Oct-Dec 2012; 43(4) p-1351.
42. Singh Vibha, Pal Mahesh, Gupta Shalini, et al, Turmeric – A new treatment option for lichen planus: A piolet study, National Journal of Maxillofacial Surgery, edition Jul-Dec 2013; 4(2) p-198.
43. Naeini Fatemi Farahnaz, Saber Mina, Faghihi Gita, Lichen Planopilaris: A review of evaluation methods, Indian Journal of Dermatology, Venereology and Leprology, edition 2021; 87(3) p-442.
44. <https://www.trichos.in/lichen-planopilaris>
45. Umar Sanusi, Kan Petrina, Carter J. Marissa, Lichen Planopilaris Responsive to a novel phytoactive botanical treatment: A case series, Dermatology and therapy (Heidelb), edition 2022; 12 p-1707.
46. Nobles Timothy, Harberger Seneca, Krishna Murthy Karthik, Cradle Cap, National Library of Medicine, National Center for Biotechnology Information, edition 2022; p-1.
47. <https://www.healthdirect.gov.au/cradle-cap>.
48. Nobles Timothy, Harberger Seneca, Krishna Murthy Karthik, Cradle Cap, National Library of Medicine, National Center for Biotechnology Information, edition 2022; p-1.
49. <https://parenting.firstcry.com/articles/easy-and-effective-home-remedies-for-cradle-cap-in-babies/>
50. Broshtilova Valentina, Bardarov Emil, Kazandjieva Jana, Marina Sonya, Tufted hair folliculitis: A case report and literature review, Acta Dermatovenerol APA, edition 2011; 20(1) p-27.
51. Winters D. Richard, Mitchell Mark, Folliculitis, National Library of Medicine, National Center for Biotechnology Information, edition 2022; p-2.
52. <https://pubmed.ncbi.nlm.nih.gov/11270300/>
53. <https://www.kimshealth.org/blog/7-home-remedies-treat-and-prevent-mild-folliculitis/>
54. Leung C. K. Alexander, Hon L. Kam, Leong F. Kim, et al, Tinea Capitis: An updated review, Recent patents on inflammation & allergy drug discovery, edition 2020; 14(1) p-58.
55. [https://www.mayoclinic.org/diseases-conditions/ringworm-scalp/symptoms-causes/syc-20354918#:~:text=Ringworm%20of%20the%20scalp%20\(tinea,No%20worm%20is%20involved.](https://www.mayoclinic.org/diseases-conditions/ringworm-scalp/symptoms-causes/syc-20354918#:~:text=Ringworm%20of%20the%20scalp%20(tinea,No%20worm%20is%20involved.)
56. Hay J. R, Tinea Capitis: Current Status, Mycopathologia, edition 2017; 182(1) p-89.
57. <https://www.healthline.com/health/home-remedies-for-ringworm>
58. Kumar Bangalore Anagha, Shamim Huma, Nagaraju, Premature graying of hair: Review with updates, International Journal of Trichology, edition 2018; 10(5).
59. <https://www.bbc.com/future/article/20121016-can-stress-turn-your-hair-grey>
60. Singh Rashmi, Madke Bhushan, Bansod Shashank, Yadav Nidhi, Premature graying of hair: A concise review, Cosmo Derma, edition; 1(65).
61. <https://www.shoprhythm.com/blogs/hair-care/11-best-essential-oils-for-grey-hair>
62. <https://www.johnfrieda.com/en-us/blog/frizzy-hair/what-causes-frizzy-hair/>
63. <https://www.lovecurlyhair.com/what-is-frizzy-hair-help/>
64. <https://www.johnfrieda.com/en-us/blog/frizzy-hair/what-causes-frizzy-hair/>
65. <https://www.vedaoils.com/blogs/essentialoils/essential-oils-for-frizzy-hair>
66. <https://hairlust.com/blogs/blog/split-ends>
67. <https://www.vibrantsalonandspa.com/b/different-types-of-split-ends-and-its-treatment>
68. <https://www.vibrantsalonandspa.com/b/different-types-of-split-ends-and-its-treatment>