A Review on Cosmetic Preparation of Hair

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ABSTRACT

Hair is an integrated system with a particular chemical and physical behaviour. It is a complex structure of several morphological components that act as unit and has several functions, from protecting of skins to sexual and social communications. In literature, there are various study about hair that take into consideration different aspects within many fields of science, including biology, dermatology, cosmetics, forensic science and medicine. These review the formulations and mode of action of hair cosmetics, summarized the principal anatomical and physiological aspect of different types of human hair, hair growth cycle, hair porosity. This review could be the basic improvement and progression in the field of hair research.

Keywords: Hair, Hair cosmetic, shampoo, hair dyes, hair conditioner, Hair growth cycle, Hair porosity, Anatomy of hair

INTRODUCTION

Hair has two parts the follicle is in the skin and the shaft which is visible above the head. The hairs follicle has several layers with different function: substance that help to prevent hair and skin drying out. The origin of hair by week22, developing fetus has all of its hair follicle form.

At this stage of life there are about 5millio hair follicles on the body. There are total of one million on the head, with one hundred thousand of those follicles residing on the scalp. This is the largest number of hair follicles a human will ever have, since we don’t generate new hair follicles during the course of our live.[1,2]

HAIR COLOUR:

Hair colour is the pigmentation of hair follicles due to two types of melanin: eumelanin and pheomelanin. Generally, if more eumelanin is present, the colour of the hair is darker; if less eumelanin is present, the hair is lighter. The darker a person’s natural hair colour, the more individual hair follicles they have on their
scalp. Levels of melanin can vary over time causing a person's hair colour to change, and it is possible to have hair follicles of more than one colour on the same person. Particular hair colours are associated with ethnic groups. Gray or white hair is associated with age.[4]

**Genetic and biochemistry of hair colour:**

The genetics of hair colours are not yet firmly established. According to one theory, at least two gene pairs control colour. One phenotype (brown/blonde) has a dominant brown allele and a recessive blond allele. A person with a brown allele will have brown hair; a person with no brown alleles will be blond. This explains why two brown-haired parents can produce a blond-haired child. However, this can only be possible if both parents are heterozygous in hair colour- meaning that both of them have one dominant brown hair allele and one recessive allele for blond hair, but as dominant traits mask recessive ones the parents both have brown hair. The possibility of which trait may appear in an offspring can be determined with a Punnett square.[7]

**Hair Growth Cycle**

Hair on the scalp grows about .3 to.4mm/day or about 6 inches per year. Unlike other mammals, human hair growth and shedding is random and not seasonal or cyclical. At any given time, a random number of hairs will be in one of three stages of growth and shedding: anagen, catagen, and telogen.

![Fig2: Hair growth cycle](image)

**Anagen**

Anagen is the active phase of the hair. The cells in the root of the hair are dividing rapidly. A new hair is formed and pushes the club hair (a hair that has stopped growing or is no longer in the anagen phase) up the follicle and eventually out.

During this phase the hair grows about 1cm every days. Scalp hair stays in this active phase of growth for two to six year. Some people have difficulty growing their hair beyond a certain length because they have a short active phase of growth. On the other hand, people have long active phase of **Anagen**

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The hair on the arms, legs, eyelashes, and eyebrows have a very short active growth phase of about 30 to 45 days, explaining why they are so much shorter than scalp hair.

**Catagen**

The catagen phase is a transitional stage and about 3%of all hairs are in this phase at any time. This phase lasts for about two three weeks. Growth stops and the outer root sheath shrinks’ and attaches to the root of the hair. This is the formulation of what is known as a club hair.

**Telogen**

Telogen is the resting phase and usually accounts for 6% to 8% of all hairs. This phase lasts for about 100 days for hairs on the scalp and longer for hairs on the eyebrow, eyelash, arm, and leg. During this phase, the hair follicle is completely formed. Pulling out a hair in this phase will reveal a solid, hard, dry, white material at the root. About 25 to 100 telogen hairs shed normally each day.[8]

**Why don't we have hair on palms?**

The main functional reason is we need to be able to grip things with our hands (and feet, which are also hairless), and hair would interfere with that. Physiologically, the epidermis in these parts of the body is very thick and highly keratinized, and when combined with the thick under laying layer of dermis, this results in skin that does not support the growth and maturation of hair follicles

Typically, people don't grown hair on the soles of our feet or palms of our hands. This is because this skin on these parts lacks hair follicles, and does not therefore produce hair.[9]

**Hair porosity:** Hair porosity refers to how much moisture it certain. Certain hair types like curly hair may be impacted by porosity more than others due to a lack of moisture, but porosity can impact other hair
Hair porosity can be determined in different ways"[9]. Hair porosity can be determined by using three methods:

1. **The float test**: Take a couple of hair strands of hair from the comb or brush and drop them into a bowl of water. Let them sit for 2-4 minutes. If the hair is floated, that means low porosity. If it sinks, that is high porosity.

2. **The slip’n’slide test**: Take a hair strand of hair and slide the fingers up the shaft. If you feel little bumps along the way, this means that your cuticle is lifted and that you have high porosity. If the fingers slip smoothly, then it has low porosity hair[10].

3. **“The spray bottle test**: take a small section of hair and pin the rest back. Spray that section with a little water and mist it. If the water sits on the top of hair beads up, i.e. low porosity hair. If hair absorbs the water quickly i.e. high porosity hair. If the water sits on the hair for several minutes then is absorbed i.e. normal porosity hair”.[11]

### Formulation of shampoo

1. **Preservative**: Anionic surfactant, Example: Sodium Lauryl Sulphate

2. **Conditioning agent**: improve manageability, feel and lustre of hair, Example: Lanoline, Mineral oil, Egg albumin, Amino acids, Lecithin and herbal extract like Shikakai and Henna.

3. **Thickening agent**: make shampoo viscous so that they are easy to pour and handle. Example Gum, CMC, HPMC, PVA, carbopol 934p etc.

4. **Chelating agent**: prevent deposition of calcium and magnesium salt of soap on hairs. Examples: Disodium edetate, polyphosphates, citric acid, etc.

5. **Antidandruff agent**: zinc pyridium thiol-N-oxide (ZPTO), Selenium sulphide, bithinol, resorcinol, etc.”[21]

### Types of shampoo:

- “Liquid shampoo
- Powder shampoo
- Cream shampoo
- Gel based shampoo

### Evaluation of shampoo:

1. Changing powder
2. Foaming powder
3. eye irritation potential.[13]
# Formulations of Shampoo According to Their Classification:

## Powder Shampoo
- **Henna powder**: 5%
- **Soap powder**: 50%
- **Sodium carbonate**: 22.5%
- **Borax**: 15%
- **q.s**

## Cream Shampoo
- **SLS**: 38%
- **Cetyl alcohol**: 7%
- **Water Upto**: 100%
- **Color, perfume**: q.s

## Liquid Shampoo
- **SLS**: 40%
- **NaCl (to desired viscosity)**: 2-4%
- **Water Upto**: 100%
- **Perfume, color, preservatives**: q.s

## Jelly Shampoo
- **Alkyl dimethyl benzalconium chloride**: 15%
- **TLS**: 28%
- **Coconut ditethanolamide**: 7%
- **HPMC**: 1%
- **Water**: Upto 100%
- **Color, perfume, preservative**: q.s

## Aerosol Shampoo
- **TLS**: 60%
- **Coconut diethanolamide**: 2%
- **Water**: Upto 90%
- **Propellant**: 10%
- **Color, perfume, preservative**: q.s

## Anti-Dandruff Shampoo
- **Thymol**: 0.05%
- **Menthol**: 0.1%
- **Camphor**: 0.1%
- **TLS**: 55%
- **Water upto**: 100%
- **Color, perfume, preservative**: q.s

## Two Layer Shampoo
- **Cocamidopropylamine oxide**: 5%
- **Lauramine DEA**: 1%
- **Lactic acid (50%)**: 1%
- **Formaldehyde**: 0.1%

## Herbal Shampoo
- **Natural essential oil blend**: 0.5%
- **Cyamopsis tetragonoloba (Guar Gum)**: 1%
- **Camellia sinensis (Green Tea) extract**: 2%
- **Glycerin**: 1%
- **Hydrolysed wheat protein**: 2.5%
- **Salvia officinalis (Sage) leaf extract**: 1.5%
- **Salvia officinalis (Sage)**: 1.5%
- **Glyceryl oleate**: 1%
- **Polysorbate 20**: 0.5%
- **Potassium sorbate**: 5%
- **Aloe barbadensis (Aloe vera) extract**: 0.5%
- **Arctium minus (Burdock) root extract**: 0.5%
- **Disodium coco-glucoside sulfosuccinate**: 0.5%
- **Preservatives**: q.s

## Design:
- **Hair dyes**

**Definition:** Hair colourants are the cosmetic preparations which are used by men and women either to change the natural hair colour or to mask grey hair. The properties of typical hair colourants are

- The formulation of the hair colourant should be stable.
- They should colour the hair evenly.
- They should not lead to loss of the natural shine of hair.
- The shaft of the hair must not be damaged.
- The natural moisture of the hair must not be lost.
- Must possess properties like non-irritant and non-sensitizing.
Must be non-toxic in nature. Must impart stable color to the hair.

1. Temporary Hair Colorants: They are leave-in preparations. The hair is not rinsed after the application of the colorant. The colorant is easily removed with one wash using a shampoo because they are absorbed in to the cuticle and cannot enter into the cortex of the hair. They are rarely called as water rinses.

(a) Powder Formulations:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Quantity for 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified color</td>
<td>5g</td>
</tr>
<tr>
<td>Tartaric acid (buffer)</td>
<td>95g</td>
</tr>
</tbody>
</table>

2. Semi-permanent Hair Colourants / Direct Dyes

Ingredient: The semi-permanent hair colourants are composed of the following constituents.

(a) Dye
(b) Water
(c) Organic solvent like alcohol, derivatives of glycol.
(d) Fatty acid, fatty acid amide.
(e) Thickener.
(f) Surfactant
(g) Perfume
(h) Aliphatic primary amines which work as co-solvent and buffer.

(A) Dyes:
The dyes which impart different shades belong to the following categories:

(i) O-nitro anilines. (Gives yellow and orange shades)
(ii) Aminonitrophenols and their ethers (gives yellow and orange shades)
(iii) Azo dyes (Gives yellow and orange shades)
(iv) Nitrodiphenylamines (Gives orange to red shades).
(v) Nitrophenylenediamines (Gives colour in the range red to violet).
(vi) Anthraquinone (Gives violet to blue shades).

5. Natural dyes: Since, antiquity, plant materials are looked upon as beneficial sources for various ailments and other purposes. The leaves are used as colourants:[22-23]

<table>
<thead>
<tr>
<th>Formula</th>
<th>Quantity for 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid dyestuff (color)</td>
<td>6g</td>
</tr>
<tr>
<td>Alcohol (antiseptic)</td>
<td>10g</td>
</tr>
<tr>
<td>30% acetic acid (buffer)</td>
<td>10g</td>
</tr>
<tr>
<td>Water (solvent)</td>
<td>74g</td>
</tr>
</tbody>
</table>

(B) Colour Shampoos:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Quantity for 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium lauryl alcohol sulphate (surfactant)</td>
<td>30g</td>
</tr>
<tr>
<td>Coco diethanolamide (pearlescent stabilizer )</td>
<td>2g</td>
</tr>
<tr>
<td>Water (solvent)</td>
<td>To make up to 100 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formula</th>
<th>Quantity for 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powdered henna (color)</td>
<td>89g</td>
</tr>
<tr>
<td>Pyrogallic acid (color)</td>
<td>6g</td>
</tr>
<tr>
<td>Copper sulphate (color)</td>
<td>5g</td>
</tr>
</tbody>
</table>
### CLASSIFICATION OF COMMERCIAL DYE

<table>
<thead>
<tr>
<th>Chemical Group</th>
<th>Prominent Example</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indegoids</td>
<td>Indigo, tyrian, purple</td>
<td>Blue-pink</td>
</tr>
<tr>
<td>Anthraquinones</td>
<td>Lac, kermes, cochineal, madder(alizarian)</td>
<td>Red class of dye</td>
</tr>
<tr>
<td>Alpha-nepthquinon flavons</td>
<td>henna(lawsone)</td>
<td>Orange</td>
</tr>
<tr>
<td>Anthocynines</td>
<td>weld(reseda luteola linn)</td>
<td>Yellow class of dye</td>
</tr>
<tr>
<td>Betalains</td>
<td>Grape skin extract, Bignonia Chica Humb &amp; Bonpl.</td>
<td>Red orange</td>
</tr>
<tr>
<td>Carotinoids</td>
<td>Beet-root</td>
<td>red blue</td>
</tr>
<tr>
<td></td>
<td>Annato (bixa orellana Linn)</td>
<td>yellow-orange</td>
</tr>
<tr>
<td></td>
<td>carrot</td>
<td>orange</td>
</tr>
<tr>
<td></td>
<td>Curcumin from termaric</td>
<td>jafran(yellow)</td>
</tr>
<tr>
<td></td>
<td>Berbarine</td>
<td>yellow</td>
</tr>
<tr>
<td>Diferuloyl-methane</td>
<td>leaves of lucerne nettle, mulberry, green plants, pasture grasses, algae etc</td>
<td>green</td>
</tr>
<tr>
<td>Alkaloids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorophyll</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BOTANICAL USEFULL FOR HAIR CARE:

<table>
<thead>
<tr>
<th>S.no</th>
<th>Botanical/common name&amp; family</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Brassica spp,(mustard)</td>
<td>Seed oil is used as hair oil and useful for hair nourishment.</td>
</tr>
<tr>
<td></td>
<td>Brassicaceac</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Acacia concinna Dc</td>
<td>Pods extracts is used as hair cleanser and for control of dandruff.</td>
</tr>
<tr>
<td></td>
<td>(shikakai), mimosaceae</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Arnica Montana (Arnica),</td>
<td>Flower extract is used as hair</td>
</tr>
</tbody>
</table>
### Conclusion:

The use of cosmetics has been increased many folds in personal care systems, and there is great demand in the market. So, this review could be the basic improvement and formulation of the research.

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