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4.0 Structure of hair

4.1 Types of Hair

4.2 Hair Growth and Regeneration

Unit Overview

This unit will provide students information about the hair, its structure, types and growth

Duration: Total Hours: 10 (5 Theory & 5 Practicals)

Knowledge Skill and Outcomes:

1. Structure of hair
2. Internal and External division of hair
3. Types of hair
4. Hair growth cycle

Resource Material

1. Beauty Therapy: The Foundation Level II, 2e by Lorraine Nordmann
2. Professional Beauty Therapy Level III, 2e by Lorraine Nordmann
3. Milady's Standard Cosmetology, ISBN:978-1-5625-3880-2
4. Regents/ Prentice-Hall Textbook of Cosmetology by Mary Healy

Learning Outcomes: Unit 4

Unit	Manicure & Pedicure	Outcomes
4.0	Structure of Hair	- Identify the Structure of hair - Identify the Internal and External division of hair.
4.1	Type of Hair	Differentiate between the types of hair
4.2	Hair Growth and Regeneration	Identify the Hair growth cycle

Assessment Plan (For the Teachers)

Unit	Topic	Assessment Method	Time Plan	Remarks
4.0	Structure of Hair	Exercise: Question & Answer Audio Visual Aids		
4.1	Type of Hair	Exercise: Question & Answer Audio Visual Aids		
4.2	Hair Growth and Regeneration	Exercise: Question & Answer Audio Visual Aids		

Hair

Human body is covered with millions of hairs, apart from lips, parts of genitals and the undersides of hands and feet. The scalp hairs are protective while the fine hairs on rest of the body aid sensation. Hairs are considered as crowning glory. Hair is much more complex than it comes into view. It helps transmit sensory information and creates gender distinctiveness. Hair is significant to the appearance of men and women. There is hair on all the major visible surfaces of the body. A developing fetus has all of its hair follicles formed by week 22. At this time there are 5 million follicles on the body. One million of those are on the head, and 100,000 are on the scalp. This is the largest number of follicles we will ever have - follicles are never added during life. As the size of the body increases as we grow older, the density of the hair follicles on the skin decreases.

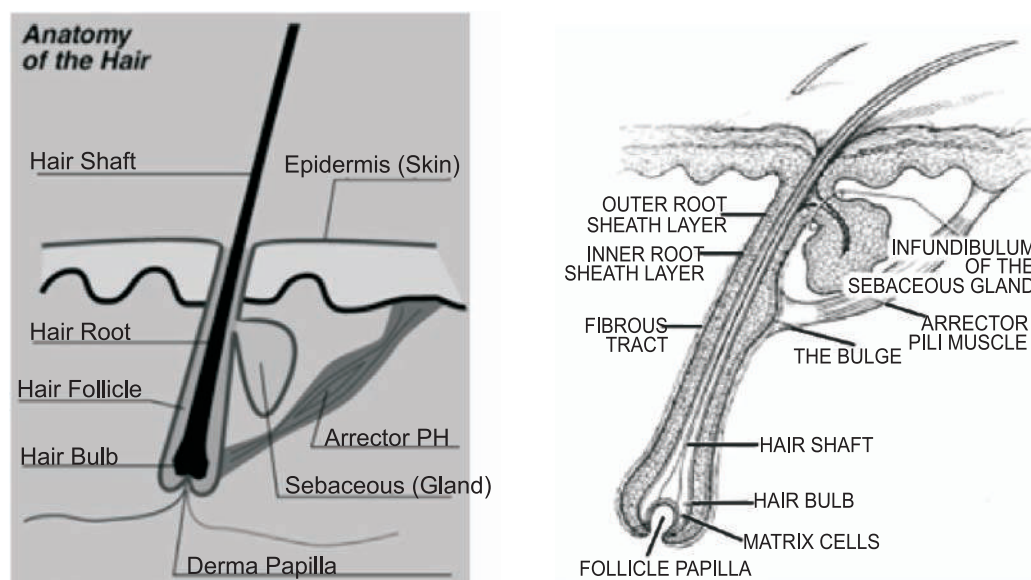
A hair is made up of 97% of protein and 3% of moisture. The life of a hair is about 3 to 7 years. An average size of head contains over 1, 00,000 hairs. On an average a hair grows about half an inch in a month time and shed about 25-50 hair in a day. Hairs indicate one's internal health.

Hair is made up of protein called Keratin, the Chemical composition of human hair is as follows

- 45.2 % Carbon
- 27.9% Oxygen
- 6.6% Hydrogen
- 15.1% Nitrogen
- 5.2% Sulphur

4.0 STRUCTURE OF HAIR

The Scientific detailed study of hair is termed as 'Trichology'. Hair consists of a tough Protein called Keratin. Other ingredients include some metals, minerals and moisture.



Structure of the Hair

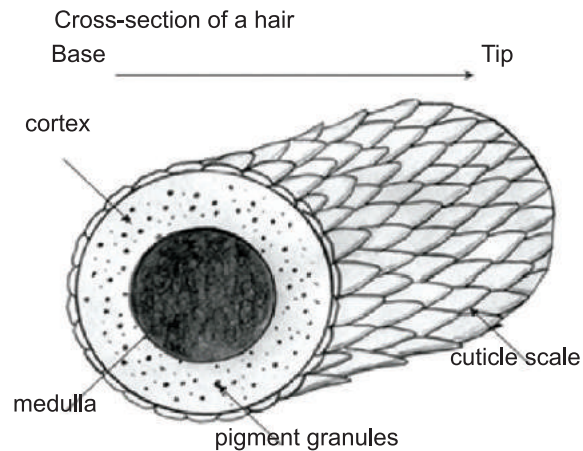
Root - The Root has several layers with diverse jobs. At the base of the root is a projection formed like sticking a finger in the bottom of a stocking and pushing it in a small amount. This projection is called a papilla and it contains capillaries, or tiny blood vessels, that feed the cells. The living part of the hair is bottom part of the stocking surrounding the papilla called the bulb. This bottom part is the only part fed by the capillaries. The cells in the bulb divide every 23 to 72 hours, faster than any other cells in the body.

Sebaceous Gland - The sebaceous gland is important because it produces sebum which is a natural conditioner. More sebum is produced after puberty. The sebum production decreases in women throughout their lives. The production also decreases in men, but not as much as in women.

Shaft - The hair shaft is made up of dead, hard protein called keratin in three layers. The inner layer is called the medulla and may not be present. The next layer is the cortex and the outer layer is the cuticle. The cortex makes up the majority of the hair shaft. The cuticle is formed by tightly packed scales in an overlapping structure similar to roof shingles. Most hair conditioning products attempt to affect the cuticle. There are pigment cells that are distributed throughout the cortex and medulla giving the hair its characteristic color.

The **External** division of a hair is:

- **Root**- The only living part of the hair
- **Shaft** The visible part of the hair
- **Point** The end of hair



Cross Section of Hair

The **Internal** division of hair is division into three parts

- **Cuticle** This is the protective outer layer of the hair which has tiny overlapping cells. These overlapping cells are responsible for the look of hair. If these cells or scales lie flat, the hair looks silky and shiny & if these scales have been damaged, the hair looks very dull & untidy.
- **Cortex**- This is the second layer of hair which provides elasticity and strength to the hair. This layer is also responsible for the color of the hair as it contains the pigments like melanin, pheomelanin, and eumelanin.
- **Medulla** Actually this is the innermost layer of the hair and its function is not properly known. But it is said that it is the carrier of some nutrients to the cortex & cuticle.



Internal Division of Hair

As the only living part of the hair is root which is situated in the dermis, the inner layer of the skin. Uncountable tiny glands called sebaceous glands are also present in the dermis. These glands produce a lubricant cum antiseptic liquid conditioner called sebum for the hair follicle, which gives a protective coating to the hair. This sebum is responsible for the look & type of hair. In result of hormonal imbalance, excessive sebum makes the hair greasy & a little sebum makes the hair dry.

Hair Pigment

Hair color is mostly the result of pigments -- chemical compounds that reflect certain wavelengths of visible light. There are two main pigments found in human hair: Eumelanin has an oval or elliptical shape, which gives color to brown or black hair and is a dark pigment. The higher the concentration of Eumelanin, the darker the hair.

Pheomelanin is what produces the color in blonde or red hair. The higher the concentration of pheomelanin, the lighter the hair. Unlike eumelanin, pheomelanin is smaller, partly oval and has a rod shape.

Review Questions:

- a) Hair is made up of _____
- b) Scientific study of hair is termed as _____
- c) _____ is the protective outer layer of Hair shaft.
- d) _____ is the pigment which gives colour to the hair.

4.1 TYPES OF HAIR

Every person has individual hair as finger prints. Hair is the mirror of your internal health. A healthy scalp, where circulation is good, contains healthy hairs. Hair root is situated in **follicle** which is present in the inner layer of the skin called **Dermis**.

Many factors are responsible for the types of different kind of hair, they are as under:

1. General Health
2. Hormones of the body
3. Clients age
4. Dietary habits
5. Seasonal changes
6. Climate
7. Anxiety & Stress
8. Hair care regime.

Above mentioned factors can affect the blood circulation of the body this can divert the blood flow from scalp to other parts of the body. This can effect the oxygen, which is supplied to the scalp. This can result in unhealthy hair.

Hair types are classified under four main categories i.e

1. Normal hair
2. Dry hair
3. Greasy hair
4. Combination hair

1. **Normal Hair** - These hairs are best of all the four types of hairs. They are the healthy hairs with natural fullness and shine. Normal hair is neither greasy nor dry and looks good most of the time. It is easy to care for and doesn't require much effort to keep it looking healthy and shining.
2. **Dry Hair** Dry hair looks dull, and may tangle easily, in which case it will be difficult to comb or brush. It is also more likely to split at the ends. Dryness may be the natural state of your hair, due to your hair follicles tending to produce too little sebum or natural oils. Excessive shampooing misuse of colors, perm and damage from the sun or harsh weather conditioners can also dry your hair.

Causes: Insufficient **sebum**, which is produced by sebaceous glands situated beneath the skin is the main cause of dry hairs.

Apart from this many external factors are responsible for dryness in hair they are mentioned herewith.

- Excess heat due to sun exposure
- Imbalance or faulty diet
- Frequent shampooing, bleaching, perming, colouring and excess use of thermal styling
- Harsh weather conditions
- Poor blood circulation because of zinc and fatty acids in the body
- Keratin helps the hair to hold the moisture in it, if Keratin is reduced in the hair they become dry with split ends

Solutions:

- Dry hairs frequently needs nourishing and conditioning
- Try to dry hair naturally whenever is possible
- Use of a mild shampoo is recommended
- Protein rinse can be helpful
- Regular oil treatment on scalp with rich oils like coconut, almond, olive and sesame can help to tackle the problem
- Protein rich conditioner also helps in this condition
- If dry hair are combined with split ends then trim your hair half an inch in every eight weeks
- Alcohol free gels are recommended

3. **Greasy Hair** - They looks oily, dull, limp and unmanageable. Greasy hair, by contrast, looks lank and oily. This is caused by an over-production of sebum, which may be linked to hormonal disturbances, stress, or a diet too rich in saturated fat, but is more commonly genetically inherited. Greasy hair also becomes dirty more quickly than other hair types, as it attracts more dust and dirt.

Causes: Over production of sebum by sebaceous glands is the main reason for greasy hairs. The main factors responsible for this condition are as under:

- Hormonal disturbances.
- Heredity
- Stress and anxiety
- Hot & humid weather conditions
- Constantly running hands through the hair.
- Excessive perspiration
- Faulty diet as rich saturated fatty diet or diet rich in fine white flour and sugar

Solutions: For heredity and hormonal factors you can't change much but you can try to minimize the effects. You can help the external factors like:

- Use a gentle and non-aggressive shampoo regularly to make your hair heavier
- Try to eat a healthy balance diet with atleast 10-12 glasses of water a day. Reduce the spices, dairy fats, and greasy fast foods. Add plenty of fresh raw fruits and vegetables in your diet.
- Try to balance between work, rest and exercise.

4. **Combination Hair:** This hair type is greasy at the roots, but often dry and sometimes split at the ends, when shampooed too often or with the wrong shampoo. It frequently occurs in hair that has been harshly treated with chemicals and over-strong shampoos, or that has been over-exposed to sunlight and heating and setting equipment. The scalp produces too much sebum, while the ends are damaged and loose moisture.

Causes: External factors are responsible mainly for this hair condition. They are as under:

- Excessive use of chemical treatments using the detergent-based shampoo.
- Frequent use of thermal hair styling.
- Excess sun exposure
- Imbalance between diet, work, rest and exercise.

Solutions:

- Try to use mild and gentle hair products like shampoo and conditioner and other hair products. Use mild shampoo on scalp and condition the ends of the hairs.
- Take balanced healthy diet and avoid fatty, spicy & sugary products.
- Balance between work, rest and exercise.

CHEMICALLY PROCESSED HAIRS

Generally hair is badly damaged by the chemical treatments like coloring and perming. Hair becomes more porous and they can't hold on the moisturizer properly.

Solutions:

- They need mild & gentle shampoos and good hair conditioners and hair moisturizer.
- Try to avoid heat, either sun rays or hair dryers, let the hairs dry naturally.
- Deep conditioning once a week helps to restore shine & electricity of hair.

Other Hair Types

Fine hair is close to the resolution of the human eye, about as fine as we can see. Hair thickness varies from person to person. It's anywhere between 1/1500 to 1/450 inches (17 to 181 microns). Hair color is the biggest factor. Golden hair is the finest (1/1500 to 1/500 inches, 17 to 51 microns) and black hair the coarsest (1/450 to 1/140 inches, 56 to 181 microns).

Hair shape (round or oval cross-section) and texture (curly or straight) is influenced heavily by genes. However, nutritional status and intentional alteration (heat, curling, perms) can affect the physical appearance of hair.

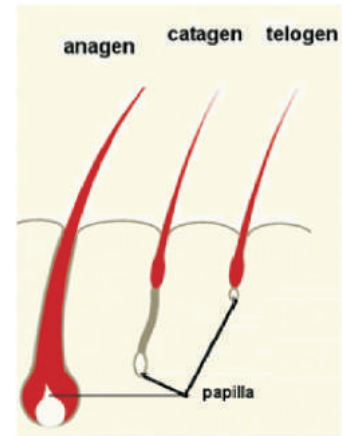
Review Questions:

- List the factor responsible for type of Hair.
- List four main categories of hair type.
- Name five causes of Dry Hair condition.
- Describe oily hair condition.

4.2 HAIR GROWTH AND REGENERATION

Hair grows from the hair follicle which is a pocket like structure present in the inner layer of the skin called Dermis. Just under the follicle there are part called Papilla which continuously producing the cells. These cells are pushed up to the follicle and become little harder to become a protein called Keratin which we known as Hair.

The only living part of hair is root which is situated under the skin of scalp. The hair which is growing & coming out of the scalp is a dead tissue.

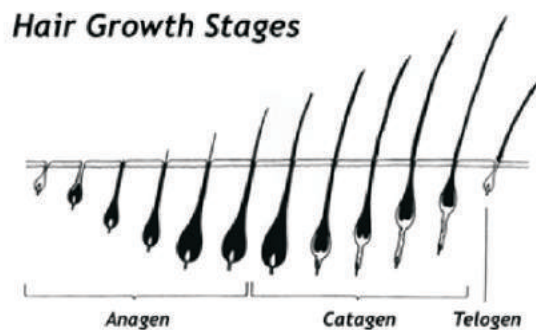


Regeneration of Hair

THE HAIR GROWTH CYCLE

Hair on the scalp grows about .3-.4 mm/day or about 6 inches per year. Unlike other mammals, hair growth and loss is random and not seasonal or cyclic. At any given time, a random number of hairs will be in various stages of growth and shedding.

There are three stages of hair growth: catagen, telogen, and anagen. Refer image



Catagen - The catagen phase is a transitional stage and 3% of all hair are in this phase at any time. This phase lasts for about 2-3 weeks. During this time growth stops and the outer root sheath shrinks and attaches to the root of the hair.

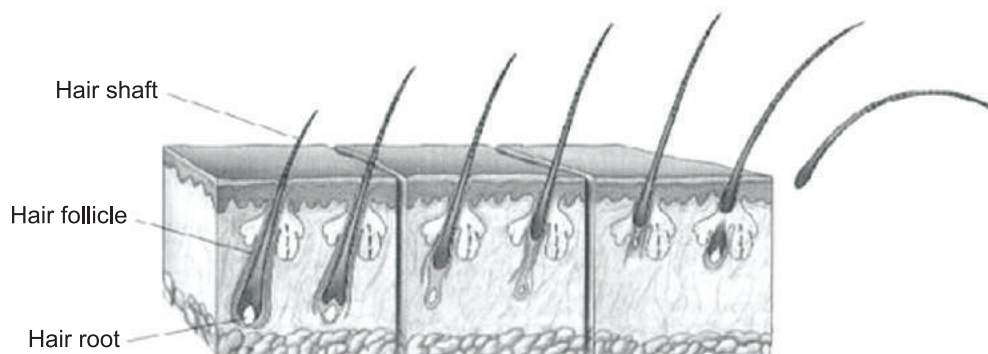
Telogen - Telogen is the resting phase and accounts for 10-15% of all hair. This phase lasts for about 100 days for hair on the scalp and much longer for hair on the eyebrow, eyelash, arm and leg. During this phase the hair follicle is completely at rest and the club hair is completely formed. Pulling out a hair in this phase will reveal a solid, hard, dry, white material at the root. About 25-100 telogen hairs are shed normally each day.

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 up the follicle and eventually out. During this phase the hair grows about 1 cm every 28 days. Scalp hair stays in this active phase of growth for 2-6 years. 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 with very long hair have a long active phase of growth. The hair on the arms, legs, eyelashes, and eyebrows have a very short active growth phase of about 30-45 days explaining why they are so much shorter than scalp hair.

About **93%** of an individual's hairs are in **anagen** phase. **Catagen** phase is about **1%** and **6%** is the **telogen** phase.

A variety of factors can affect the hair growth cycle and can cause temporary or permanent hair loss, including medication, radiation, chemotherapy, exposure to chemicals, hormonal & nutritional factors, thyroid disease, skin disorders and stress.

Androgen is main control factor of human hair growth. Androgen must be present for the growth of beard, underarms and pubic hair. Growth of scalp hair is not androgen dependent.



Review Questions:

Three stages of hair re-growth are:-

- i) _____
- ii) _____
- iii) _____
- b) _____ is the testing phase of Hair
- c) _____ it the active phase of Hair
- d) _____ is the transitional phase of Hair.

SUMMARY

Human body is covered with millions of hair. Hair is primarily comprised of protein called Keratin. Hair is categorized of four types, i.e. Normal, Dry, Oily, Combination hair. Hair on scalp grown about six inches per year. There are three stages of hair growth, Catagen, anagen&telogen. About 93% of individual's hairs are in anagen phase. Catagen phase is about 1% and 6% is the telogen phase.

EXERCISE QUESTIONS

Theory Questions

- Q1. What is a hair & write the chemical composition of hair?
- Q2. Explain the structure of hair with illustrations?
- Q3. Explain the factors responsible for types of different hairs?
- Q4. Write the types of hairs with the process of care to be taken?
- Q5. Explain hair growth cycle with illustrations?

Practical Questions

- Q.1 Analyze the porosity and elasticity of Hair?
- Q.2 Identify different types of Hair?