Chapter 11: Properties of the Hair and Scalp

Cosmetologists should study the properties of the hair and scalp so that they can differentiate between normal and abnormal hair loss, offer a variety of chemical services to clients, and aid a client in caring for their scalp and hair well-being.

Trichology- study of hair and its diseases and care

Structure of the Hair

Human hair is divided into two parts:

(“epi”- means above or outer; “derm”- means skin so epidermis is the OUTER layer of skin)

- **Hair root** *(roots are underground)*- located below the epidermis
- **Hair shaft**- located above the epidermis

Structures of the Hair Root (220-221)

- **Hair follicle**- tube-like depression or pocket in the skin or scalp that contains the hair root
- **Hair bulb**- lowest part of a strand of hair; thickened, club-shaped
- **Dermal papilla**- small, cone-shaped elevation located at the base of the hair follicle that fits into the hair bulb
- **Arrector pili** muscle- small, involuntary muscle in the base of the hair follicle; when it contracts, we get goose bumps
- **Sebaceous glands**- oil glands in the skin that are connected to the hair follicles; secretes *sebum* (fatty, oily substance)
**Structures of the Hair Shaft (p. 221-222)**

- **Hair cuticle** - outermost layer of hair; consists of a single, overlapping layer of transparent, **scale-like cells**; protects inner structure of hair; **creates shines and smoothness**
- **Cortex** - middle layer of the hair; 90% of total hair weight comes from the cortex; **elasticity and color** are the result of protein in the cortex
- **Medulla** - innermost layer of hair; generally only thick, coarse hair contains a medulla; has no known purpose

**Chemical Composition of the Hair (p. 222-223)**

- **Keratinization** - process by which newly formed hair cells in the hair bulb mature, fill with keratin, move upward, lose their nucleus and die
- **COHNS** - major elements that make up the human hair:
  - Carbon
  - Oxygen
  - Hydrogen
  - Nitrogen
  - Sulfur
**Side Bonds of the Cortex** (p. 223-225)

- **Side bonds**- link the polypeptide chains (long chain of amino acids linked together by peptide bonds) together; responsible for the strength and elasticity of human hair
  - *Hydrogen Bond*- weak, physical cross-link bond that is easily broken by water or heat
  - *Salt Bond*- weak, physical cross-link bond that is broken by alkaline or acidic solutions
  - *Disulfide Bond*- strong, chemical side bond; can be broken by extreme heat, some high-temp styling tools, permanent waves and chemical relaxers

**Hair Pigment** (p.225)

- **Melanin**- the tiny grains of pigment in the cortex that give hair its natural color
  - *Eumelanin*- provides natural dark brown to black hair color
  - *Pheomelanin*- provides natural colors ranging from red to ginger to yellow and blonde tones

**Wave Patterns** (p.225-227)

- **Wave Pattern**- refers to the shape of the hair strand
  *There are several theories that try to explain the varying degree of curl in a person’s hair, but none are definite.*

<table>
<thead>
<tr>
<th>Wave Pattern</th>
<th>Shape of Cross-Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight hair</td>
<td>Round cross-section</td>
</tr>
<tr>
<td>Wavy or Curly hair</td>
<td>Oval to flattened oval cross-section</td>
</tr>
<tr>
<td>Extremely curly hair</td>
<td>Flattened cross-section</td>
</tr>
</tbody>
</table>
HAIR GROWTH (p. 227-229)

Two main types of hair found on the body are vellus hair and terminal hair.

- **Vellus hair** (*lanugo hair*) - short, fine, unpigmented, downy; appears on parts of the body that are normally considered hairless (forehead, eyelids, bald scalp); almost never has a medulla; helps with the evaporation of perspiration; women normally retain 55% more vellus hair than men
- **Terminal hair** - long, coarse, pigmented hair found on the scalp, legs, arms, and bodies of both males and females; it usually has a medulla

Growth Cycles of Hair (p. 227-229)

There are three phases of hair growth that occur over and over throughout life: anagen, catagen, and telogen.

- **Anagen phase** (growth phase) - new hair is produced; new cells are actively manufactured in the follicle; hair cells grow faster in this phase than any other normal cell in the body; the average growth of healthy scalp hair is about ½” per month; the anagen phase generally lasts from 3-5 years but can last as long as 10. The longer the anagen phase, the longer a person’s hair can grow.
- **Catagen phase** - brief transition period between the growth and the resting phases of a hair follicle; signals the end of the anagen phase; lasts from one to two weeks.
- **Telogen Phase** (resting phase) - final phase in the cycle; lasts about three to six months

On average, the entire growth cycle repeats itself once every four to five years.

<table>
<thead>
<tr>
<th>Myths</th>
<th>Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaving, clipping and cutting hair makes it grow back faster, darker, and coarser</td>
<td>Shaving or cutting hair has no effect on hair growth</td>
</tr>
<tr>
<td>Scalp massages increase hair growth</td>
<td>There is no scientific proof that massage helps hair growth</td>
</tr>
<tr>
<td>Gray hair is coarser and more resistant that pigmented hair</td>
<td>Other than lack of pigment, gray hair is exactly like pigmented hair</td>
</tr>
<tr>
<td>The amount of curly hair is always determined by racial background</td>
<td>Anyone of any race can have extremely curly hair</td>
</tr>
<tr>
<td>Hair cross-sections always relate to the amount of curl</td>
<td>Cross-sections of hair can be almost any shape and do not always relate to the amount of curl</td>
</tr>
</tbody>
</table>
Hair Loss (p. 229-232)

*Everyone loses some hair every day. Estimates range from 100-150 hairs per day although new estimates are closer 35-40 per day.

Emotional Impact of Hair Loss

Bald Men feel:

- Less physically attractive
- Less assertive
- Less successful
- Less personally likable
- Older
- More preoccupied with their baldness
- It is important to conceal or compensate for hair loss
- They experience more negative social and emotional effects

Although hair loss is less common in women than men, it can also be a traumatic and devastating experience as women have a greater emotional investment in their appearance.

Types of Abnormal Hair Loss (p. 230-232)

Alopecia- hair loss; areata- spots

- **Androgenic alopecia**- hair loss characterized by the miniaturization of terminal hair that is converted into vellus hair; usually caused by genetics, age, or hormonal changes; known as male pattern baldness in men; results in overall thinning of hair at crown in women
- **Alopecia areata**- autoimmune disorder that causes the affected hair follicles to be mistakenly attacked by a person’s own immune system; hair loss in spots
- **Alopecia universalis**- *complete body* hair loss
- **Alopecia totalis**- *complete scalp* hair loss
Hair Loss Treatments (p. 231-232)

*Only two treatments, Minoxidil and finasteride, have been proven to stimulate hair growth and are approved by the FDA for sale in the United States.

- **Minoxidil** - a topical put on the scalp twice a day; sold OTC; no serious side effects
- **Finasteride** - oral prescription for men only; serious side effects; not for use by women
- **Surgical options** - hair transplant; expensive
- **Nonmedical options** - wigs, toupes, extensions, weavings

DISORDERS OF THE HAIR (p. 232-233)

Tricho- pertaining to hair; hyper-too much; rrhexi-rupture; nodosa- nodules

- **Canities** - technical term for gray hair
  - **Congenital canities** - present at birth; present in those with albinism
  - **Acquired canities** - develops with age
- **Ringed hair** - characterized by alternating bands of gray and pigmented hair throughout the hair strand
- **Hypertriculosis** (hirsuties- think “hair suit”) - condition of abnormal hair growth; characterized by growth of terminal hair in areas of the body where only vellus hair normally grows
- **Trichoptilosis** - technical term for split ends
- **Trichorrhexis nodosa** - technical term for knotted hair
• **Monilethrix**- (necklace hair)-technical name for beaded hair (hair breaks easily between the beads or nodes)

![Monilethrix Image]

• **Fragilitas crinium**- technical term for brittle hair; hairs may split at any part of their length

![Fragilitas crinium Image]

**Disorders of the Scalp (p. 233-236)**

• **Pityriasis**- technical term for dandruff; excessive production and accumulation of skin cells
  - **Pityriasis seboides**- more severe case of dandruff characterized by an accumulation of greasy or waxy scales mixed with sebum that stick to the scalp in crusts
  - **Pityriasis capitis simplex**- technical term for classic dandruff characterized by large flakes, irritation, and an itchy scalp

**Fungal Infections**

*do not perform services on someone presenting with a fungal infection*

• **Tinea**- technical term for ringworm; characterized by itching, scales, and sometimes painful, circular lesions; contagious and easily transmitted
  - **Tinea barbae**- “barber’s itch”; similar to tinea capitis;
  - **Tinea capitis**-characterized by red papules or spots at the opening of the hair follicles; patches spread and hair becomes brittle; hair often breaks off leaving only a stump
• **Tinea favosa**- also known as tinea favus; characterized by dry, sulfur-yellow, cuplike crusts on the scalp called scutula; has a distinctive odor; scars from this are bald patches that may be pink or white and shiny
Parasitic Infections

- **Scabies** - highly infectious; blisters and pustules usually form on the scalp; excessive itching makes it worse; do not perform services on someone with scabies
- **Pediculosis capitis** - head lice; easily transmitted by contact with infested combs, brushes, hats, and personal items; do not perform services on someone with lice

Staphylococci Infections

*staphylococci are bacteria that infect the skin or scalp; do not perform services on someone with these infections

- **Furuncle** - technical name for a boil, an acute localized bacterial infection of the hair follicle that produces constant pain
- **Carbuncle** - inflammation of the subcutaneous tissue; similar to a furuncle but larger (*clue- a car is bigger than your furry uncle*)

HAIR AND SCALP ANALYSIS

- **Texture** - thickness or diameter of individual hair strand; coarse hair has the largest diameter; medium is most common; fine hair is more fragile
  - Determined by feeling a single dry strand between the fingers; take from four areas (front, temple, crown, and nape); hold each strand securely and feel with thumb and forefinger of other hand
- **Density** - measures the number of individual hair strands on one square inch of scalp; classified as low, medium or high (thin, medium, thick); blondes usually have the highest density and red heads have the lowest
- **Porosity** - ability of hair to absorb moisture
  - **Hydrophobic** *(phobic- afraid of)* - resistant to being penetrated by moisture; requires more alkaline solution during chemical services
  - **Hydrophilic** *(philic- loves)* - easily absorbs moisture; can be dry and fragile due to over processing; requires less alkaline solutions during chemical services
  - Determine porosity by taking several strands from four different areas of the head (hairline, temple crown, and nape). Hold securely and run thumb and forefinger from end to scalp.
    - Resistant feels smooth; cuticle is compact, dense, and hard
    - Porous feels slightly rough
    - Highly porous feels very rough, dry, may break
• **Elasticity** - ability of the hair to stretch and return to its original length without breaking; wet hair can stretch about 50% and dry hair can stretch about 25%
  
  ➢ **Determine elasticity** by taking a strand from four areas of the head (front hairline, crown, temple, and nape); hold single strand of wet hair and try to pull it apart
  
  Normal elasticity - stretches and returns to original length
  Low elasticity - hair breaks or fails to return to original length

**Hair Growth Patterns**

• **Hair stream** - hair flowing in same directions resulting from follicles sloping in the same direction; two streams flowing in opposite directions form a natural part

• **Whorl** - hair that forms a circular pattern; normally forms in the crown with all hair from that point growing down

![Diagram of hair growth patterns](image)

• **Cowlick** - tuft of hair that stands straight up; may be located anywhere on the head

![Image of cowlick](image)

**Notes:**

Dry hair and scalp - can be cause by inactive sebaceous glands; treat with products that contain moisturizers and emollients

Oily hair and scalp - characterized by greasy build-up on the scalp and hair caused by improper shampooing or overactive sebaceous glands; treat by properly washing with normalizing shampoo