

Forensic Hair Notes

Introduction

Human hair is one of the most frequently found pieces of evidence at the scene of a violent crime. It can provide a link between the criminal and the crime.

From hair, one can determine:

- If the source is human or animal
- Whether the hair was forcibly removed
- Race (sometimes)
- If the hair has been treated with chemicals
- Origin of the location on the source's body
- If drugs have been ingested

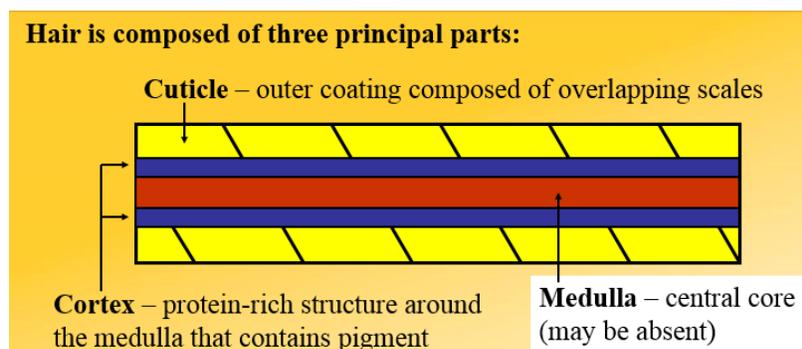
Biology of Hair

- Hair is composed of the protein keratin, which is also the primary component of finger and toe nails.
- Hair is produced from a structure called the hair follicle. Humans develop hair follicles during fetal development, and no new follicles are produced after birth.
- Hair color is mostly the result of pigments, which are chemical compounds that reflect certain wavelengths of visible light.

Biology of Hair 2

- Hair shape (round or oval) and texture (curly or straight) is influenced heavily by genes.
- The physical appearance of hair can be affected by nutritional status and intentional alteration
- The body area from which a hair originated can be determined by the sample's *length, shape, size, color*, and other physical characteristics.

Hair Structure



The structure of hair has been compared to that of a pencil with the medulla being the lead, the cortex being the wood and the cuticle being the paint on the outside.

Cuticle

The cuticle varies in:

- Its scales,

How many there are per centimeter,

How much they overlap,

Their overall shape, and

How much they protrude from the surface

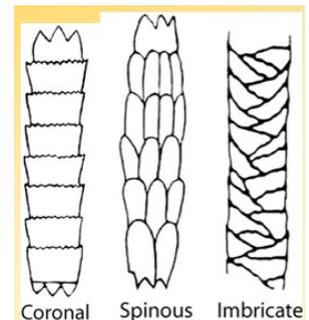
- Its thickness, and
- Whether or not it contains pigment.

Characteristics of the cuticle may be important in distinguishing between hairs of different species but are often not useful in distinguishing between different people.

The Cuticle

The cuticle is the layer of hair which is covered with scales. The scales point toward the tip of the hair.

- Scales differ among species of animals and are named based on their appearance.
- *The three basic patterns are:*
 - Coronal
 - Spinous
 - Imbricate



The Cortex

The cortex gives the hair its shape and takes up most of the space in human hair.

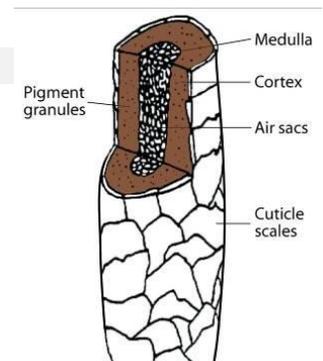
It has two major characteristics:

- Melanin—pigment granules that give hair its color
- Cortical fusi—air spaces, usually found near the root but may be found throughout the hair shaft

Medulla

The medulla may vary in:

- Thickness
- Continuity - one continuous structure or broken into pieces
- Opacity - how much light is able to pass through it
- It may also be absent in some species.
- The medulla can be important for distinguishing between hairs of different **species**, but often does not lend to the differentiation between hairs from different **people**.



The Medulla

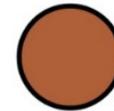
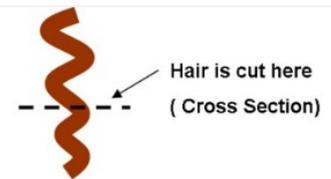
The medulla is the hair core that is not always visible. It comes in different types and patterns.

Medulla Pattern	Description	Diagram
<i>Continuous</i>	One unbroken line of color	
<i>Interrupted (Intermittent)</i>	Pigmented line broken at regular intervals	
<i>Fragmented or Segmented</i>	Pigmented line unevenly spaced	
<i>Solid</i>	Pigmented area filling both the medulla and the cortex	
<i>None</i>	No separate pigmentation in the medulla	

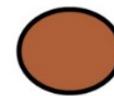
Hair Shape

Can be *straight*, *curly*, or *kinky*, depending on the cross-section, which may be:

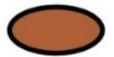
- > Round
- > Oval
- > Crescent-shaped



Asian hair
Round shape



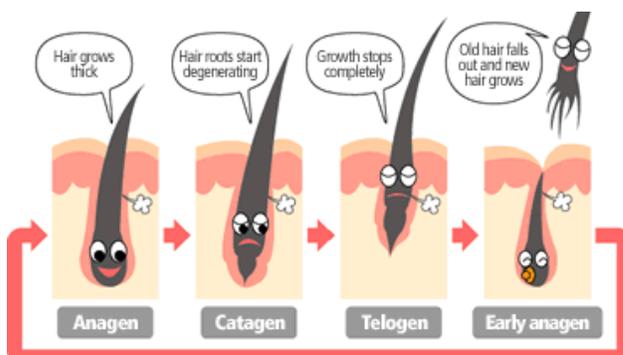
Caucasian hair
Slightly less round than asian hair



African hair
Oval or elliptical shape.

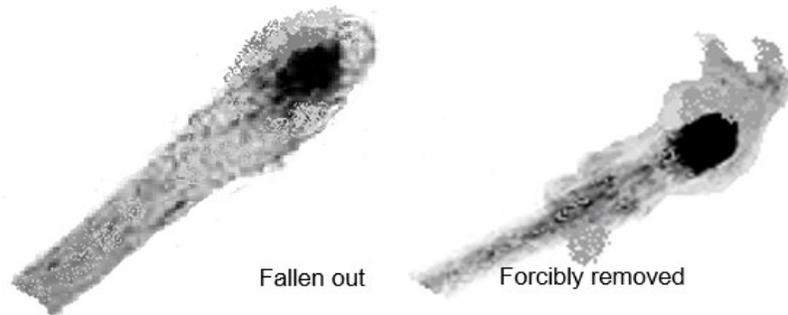
Hair Growth

- Anagen—hair is actively growing; lasts up to 5 years
- Catagen—hair is not growing; a resting phase
- Telogen—follicle is getting ready to push the hair out; lasts two to six months
- Grows about 0.4 mm per day or 1/2 inch per month



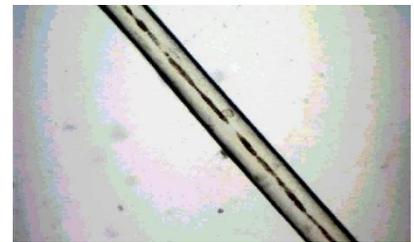
The Root

- Human roots look different based on whether they have been forcibly removed or they are telogen hairs and have fallen out.
- Animal roots vary, but in general have a spear shape.



Gray Hair

Pigment granules are absent in grey hairs



Hair Toxicology

Advantages:

- Easy to collect and store
- Is externally available
- Can provide information on the individual's history of drug use or evidence of poisoning

Collections must be taken from different locations on the body to get an accurate timeline.

Napoleon

Napoleon died in exile in 1821. By analyzing his hair, some investigators suggest he was poisoned by the deliberate administration of arsenic; others suggest that it was vapors from the dyes in the wallpaper that killed him.

Hair drug testing

Drugs can be detected in hair for up to three months after use while urine tests go back only a few days and can be easily altered.

Analyzing hair for drug abuse

Trace amounts of chemical substance are entrapped in the hair

