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.

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 (heat curling, perms, straightening, etc.).

The body area (head, arm, leg, back, etc.) from which a hair originated can be determined by the sample’s length, shape, size, color, and other physical characteristics.

In order to test hair evidence for nuclear DNA, the root must be present. The hair may also be tested using mitochondrial DNA whether or not the root is present.

Hair Structure

Cuticle – outer coating composed of overlapping scales

Cortex – protein-rich structure around the medulla that contains pigment

Medulla – central core (may be absent)

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.

Hair Structure

Cortex

The cortex varies in:
- Thickness
- Texture
- Color

Distribution of the cortex is perhaps the most important component in determining from which individual a human hair may have come.

Microscopic examination can also reveal the condition and shape of the root and tip.

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.
Fiber Evidence

A fiber is the smallest unit of a textile material that has a length many times greater than its diameter. A fiber can be spun with other fibers to form a yarn that can be woven or knitted to form a fabric.

The type and length of fiber used, the type of spinning method, and the type of fabric construction all affect the transfer of fibers and the significance of fiber associations. This becomes very important when there is a possibility of fiber transfer between a suspect and a victim during the commission of a crime.

Matching unique fibers on the clothing of a victim to fibers on a suspect’s clothing can be very helpful to an investigation, whereas the matching of common fibers such as white cotton or blue denim fibers would be less helpful.

The discovery of cross transfers and multiple fiber transfers between the suspect’s clothing and the victim’s clothing dramatically increases the likelihood that these two individuals had physical contact.

Natural Fibers

Many different natural fibers that come from plants and animals are used in the production of fabric.

Cotton fibers are the plant fibers most commonly used in textile materials.

The animal fiber most frequently used in the production of textile materials is wool, and the most common wool fibers originate from sheep.

Synthetic Fibers

More than half of all fibers used in the production of textile materials are synthetic or man-made. Nylon, rayon, and polyester are all examples of synthetic fibers.

Hair & Fiber Identification Lab

Directions:
Your team will need to use a microscope to document all the hairs and fibers in your set.

Write the name of the hair or fiber on the line and then draw what you see under medium or high power. Be sure to indicate the power of magnification!

Add a description that highlights the unique characteristics of each hair and fiber sample.

Pay attention to details to help you identify samples during the Hair & Fiber Challenge activity.

Can you identify the animal hairs shown?

Think About It ... 

(1) In which samples are we viewing the cuticle? How do they compare? 

(2) In which samples are we viewing the medulla? How do they compare? 

(3) What characteristics can be used to identify hair samples?
Can you identify the types of fibers shown?

Think About It...

(1) Which samples are natural fibers?

(2) Which samples are synthetic fibers?

(3) What characteristics can be used to identify fiber samples?