

Microscopic Examination of Hair and Fibers

Objectives:

- Distinguish between animal and human hair samples.
- Compare and contrast characteristics of hair from varying sources.
- Distinguish between natural and synthetic fibers.

Background: Often, forensic scientists need to determine the characteristics of items found at a crime scene and compare these items to ones found on a suspect or at the suspect's home, car, boat or anything connected to the suspect. Physical Properties of trace substances can be used to describe and compare these items of criminal interest. The Locard Principle states that if one surface touches another, there will be an exchange of some physical material, which can be identified. Hair and Fibers are examples of these types of material. Hair and fiber evidence is often used to identify victims and/or suspects from a crime. These crimes can include murder, sexual assault, hit and run accidents and burglary. Not only can be used to identify people, it can show the entrance or exit route of the perpetrator. Hair and fibers can be used to identify clothes or shoes, or any other item belonging to the suspect. Common characteristics of hair include color, continuous or fragmented medulla, width of hair, artificial coloring and recognizable textures. Hair can be identified from humans or different animals. If human, further DNA testing can be performed if the root containing DNA is attached to the hair.

Hair structure: The hair grows from follicles in the skin and covers the surface of mammals. A small muscle that helps the hair stand up surrounds each follicle. A nerve connects the hair follicle to the brain with a sebaceous gland next to the follicle producing sebum, an essential oil. The hair is embedded in the skin follicle at the root and extends the length of the hair shaft. A cross section of a hair includes the cuticle on the outside next to the cortex and finally the inner core is called the medulla. Most of the hair is cortex, which contains the color pigments.

Procedure/Data Collection:

View each microscopic image and complete the chart below for hair and fiber images:

Hair Data Table:

Slide Title	Color	Shape	Medulla Pattern & Classification	Bleached Or Dyed	Draw the Complete Image	Identify the Source

Fibers:

Slide Title	Color	Patterns	Shape	Draw the Complete Image	Identify the Source

Questions:

- **How is the hair cuticle used to identify different animal species?**
- **What aspect of the hair cortex is most important for the criminalist and why?**
- **Which of the following cannot be confidently determined by a microscopic examination of hair: age, sex, racial origin, the part of the body from which the hair came, or whether the hair was pulled out or fell out? Explain why or why not.**
- **List three important considerations when submitting hair samples to a crime laboratory.**
- **What is the first and most important step in the examination of fiber? What physical characteristics of fiber might help an examiner identify it?**
- **Name two analytical devices used by forensic scientists to determine the class of a fiber.**