Hair and Fiber Evidence

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Objectives

• Describe the nature of hair and fiber evidence
• Explain the different components of a hair
• Describe how to collect hair and fiber evidence from crime scenes
• Explain how hair and fiber evidence samples are analyzed in the forensic laboratory
Introduction

• Hair & fibers are among the most common types of trace and transfer evidence found at crime scenes

• Suspects often leave hair and fibers from his own body & clothing at the crime scene

• Suspects often take some fibers from the crime scene as they leave
Characteristics of Hair Evidence

• Hair is created inside the hair follicle and becomes a non-living substance as it comes to the surface of the skin.

• Certain characteristic areas are developed during the formation and growth of the hair.

• When you look at a hair pulled from a person’s head, you will see two basic parts:
  o Root
    ▪ Can have DNA
    ▪ Normally embedded in the hair follicle
  o Shaft
    ▪ Part of hair we normally see
When you view a hair sample under a microscope, you will see three main components:

- **Cuticle:**
  - Layer of scales covering the hair shaft
  - Can have a variety of patterns
    - Coronal
    - Spinous
    - Imbricate
Characteristics of Hair Evidence...

- **Cortex:**
  - The main section of the hair
  - Made up of elongated cells
  - May have inclusions present:
    - Cortical fusi (small air spaces)
    - Pigment granules (hair color)
    - Ovoid bodies (solid structures, spherical or oval shape)
Characteristics of Hair Evidence...

- **Medulla:**
  - Center core of the hair
  - Several different forms
    - Translucent (allows light to pass)
    - Opaque (no light can pass)
    - Continuous
    - Intermittent
    - Fragmented
  - Helps to determine if human or different species
Characteristics of Hair Evidence...

- Hair can also be in different stages:
  - Resting (telogen hair)
  - Actively growing (anagen hair)
  - Transitioning out of growth (catagen hair)
Characteristics of Fiber Evidence

• Fibers can be natural, made from:
  o Plants
  o Minerals
  o Animals

• Fibers can be synthetic:
  o Nylon
  o Polyester etc.
Characteristics of Fiber Evidence...

- How much fiber is transferred from its source depends upon several factors:
  - Amount of loose fibers available
  - Weave of the fabric
  - Mode of physical contact
  - Degree of contact
  - Environmental factors
Characteristics of Fiber Evidence...

- There are many types of common fibers
- Unique fibers can help to tie a suspect to a crime
  - Produced in a small amount for a limited time
  - Unusual colors

When magnified under an electron microscope a wool fiber reveals the interlocking scales that help to protect it from moisture and soil.
Collecting Hair and Fiber Evidence From A Crime Scene

• Hairs & fibers can be picked up with:
  o Gloved fingertips or with clean tweezers or forceps
  o Through a vacuum fitted with a special hair and fiber collection attachment in the hose
    ▪ Filter needs to be changed after each use
  o Tape lift
Collecting Known Hair Standards From The Head of A Suspect or Victim

- Hair collected from a person's body is called the “known standard”
- First comb the sample area to remove loose hairs
- Then use tweezers and pull out hair samples to include the root
- Hair samples should be taken from different parts of the body
Hair Test Evidence Video

Anthony defense tries to counter state hair test
Examining & Comparing Hair Samples In The Lab

- The hair is examined to see if it is human or another species.
- The sample is looked at under the microscope to see if there is any blood, hair dye, grease, etc.
- Microscopic examinations help to narrow down the pool of potential donors:
  - Medulla patterns
  - Color
  - Reflectivity
  - Root type
  - Racial origin
  - Genetic markers
Examining & Comparing Hair Samples In The Lab...

• Types of genetic markers:
  o ABO blood group
  o Sex of the donor
  o DNA (with hair root)
  o Mt-DNA (with hair shaft)
Examining Fiber Evidence In The Lab

• Different methods used:
  o The examiner can physically match two or more pieces of fabric that had been torn apart during the crime
  o The fibers can be examined under a microscope to determine characteristics such as:
    ▪ Color
    ▪ Texture
    ▪ Patterns
    ▪ Twist
    ▪ Cross-sectional appearance
    ▪ Surface characteristics
Examining Fiber Evidence In The Lab...

- Polarized light microscopy helps to identify the general class the fiber belongs to.
- Measure the physical characteristics of the fiber:
  - Density
  - Melting point
  - Ash formation
  - Tensile strength
Examining Fiber Evidence In The Lab...

- Chemical reagents can be used to test the solubility

- Other instruments can be used to determine the chemical composition:
  - Infrared spectroscopy
  - Pyrolysis gas chromatography
  - Scanning electron microscopes
  - Atomic abortion
  - Die comparison
Review

• Describe the nature of hair and fiber evidence:

• Explain the different components of a hair:
  • Cuticle- layer of scales covering the hair shaft
  • Cortex- the main section of the hair
  • Medulla- center core of the hair

• Describe how to collect hair and fiber evidence from crime scenes:
  • Suspects often leave hair and fibers from his own body & clothing at the crime scene
  • Gloved fingertips or with clean tweezers or forceps
  • Through a vacuum
  • Tape lift
Review...

- Explain how hair and fiber evidence samples are analyzed in the forensic laboratory:
  - Fibers can be examined under a microscope
  - Chemical reagents can be used to test the solubility
  - Infrared spectroscopy
  - Pyrolysis gas chromatography
  - Scanning electron microscopes
  - Atomic absorption
  - Die comparison
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