

HAIR

Forensic Science

School Year 2023-2024

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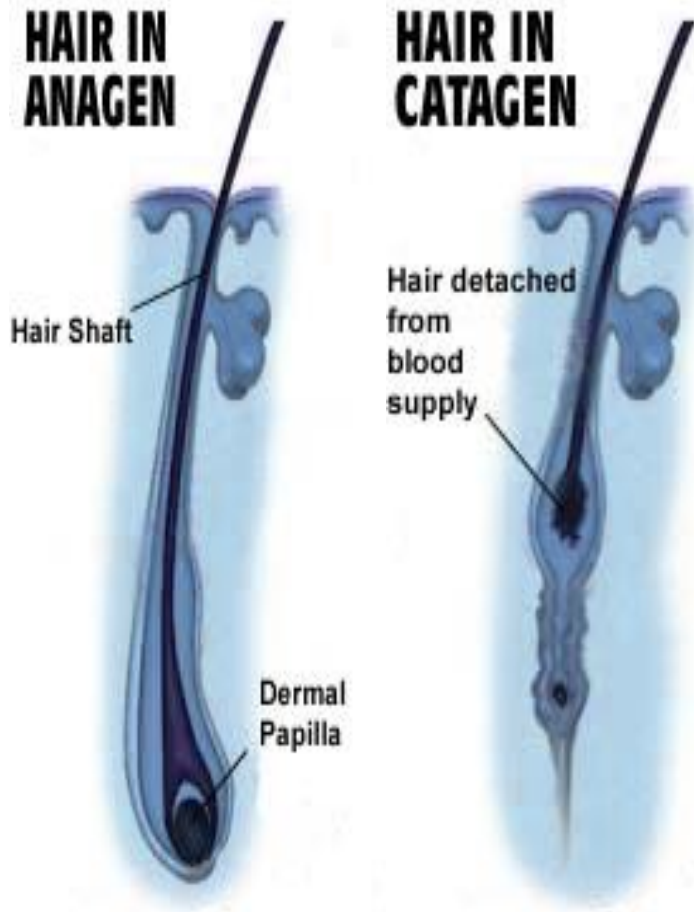
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HAIR- FORENSIC SCIENCE

- Among the many varieties of trace evidence, hair is one of the most analyzed forms of trace evidence.
- One of the great values of hair in forensic science is that it's very stable when compared to other body tissues.
- However, if 2 hairs are similar, it does not automatically indicate that someone is guilty, but it will allow investigators to continue to focus on the person as a suspect and gather additional evidence, including DNA testing, to either prove the guilt or support the innocence of the suspect.



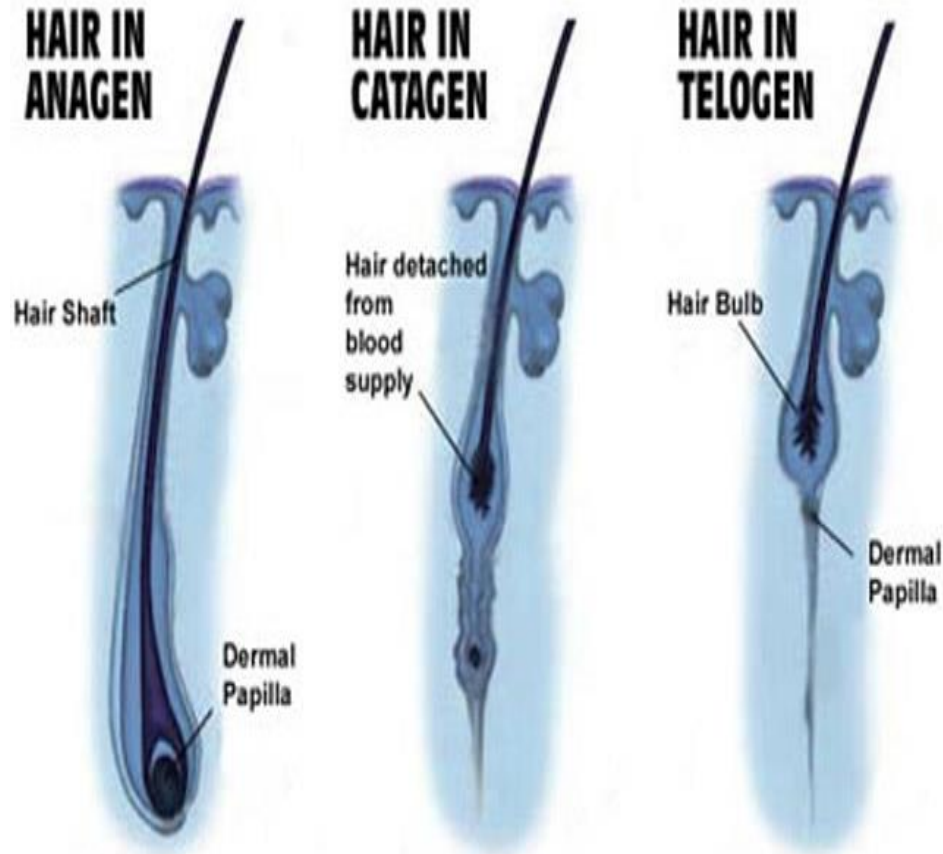
THE LIFE STAGES OF HAIR



- Most hairs are in an actively growing stage called the **anagen phase**, in which new cells are being added at the hair root, pushing the hair shaft further toward the body surface.
- The **anagen growth** phase can last as long as 2 to 7 years for scalp hair, depending on the type of body hair and possibly genetics.
- If a hair is pulled forcibly during this growth phase, a follicle tag will remain on the ribbon-like end of the hair root; you may have seen this white residue if you have plucked an eyebrow.
- In violent crimes in which people struggle with each other, hair may be pulled out and left at the crime scene or transferred from one person to another.
- Near the end of a hair's life cycle, it enters the **catagen phase**, where growth begins to slow down. The hair root begins to shrivel away from the follicle and becomes elongated.

THE LIFE STAGES OF HAIR CONTINUED

- The final phase in the life of a single hair is the **telogen phase** and is the time when a hair is getting ready to be shed naturally. It breaks away from the follicle, and the root takes on a more bulbous shape. A hair may remain lodged in its follicle in the **telogen stage** for several months before actually falling out.
- Numbers of typical hairs lost per day range from a few dozen to 100 or more, depending on age and health, and it takes about 6 months to regrow a full scalp of hair.
- **Telogen hairs** are typically the type found at crime scenes and analyzed in case samples.
- Depending on the amount of body hair a person has and how often that person vacuums, there may be hundreds or even thousands of shed hairs in someone's home or vehicle at any given time.
- However, shed hairs can easily be transferred from one place to another by an object or person that the hair doesn't belong to. In that sense, hair is always circumstantial evidence.

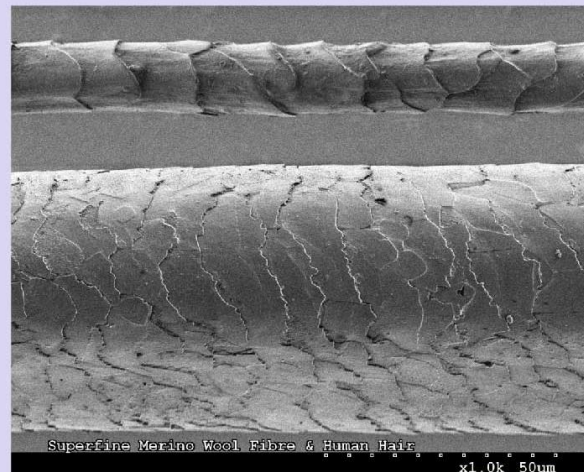


THE MICROSCOPIC ANATOMY OF HAIR

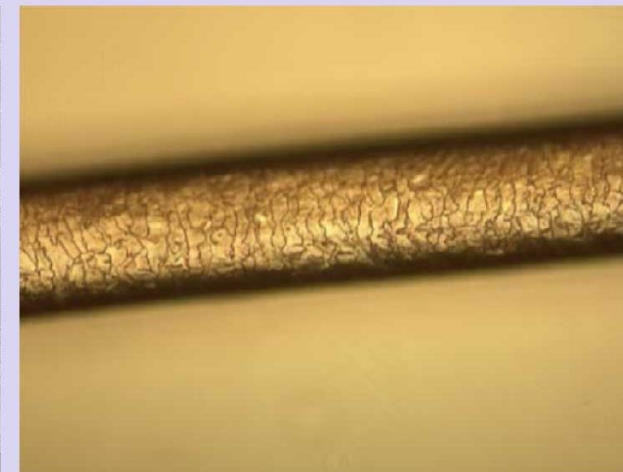
- Telling the difference between hairs from different parts of the human body is fairly easy—sometimes with the unaided eye—by using characteristics such as length, texture, color, and diameter, but there are underlying microscopic differences that relate to the obvious differences that can be seen.
- The ends of hair that have been cut or shaved have a blunt tip while body hairs that are not have a naturally tapered end, and scalp hairs that are long and not recently cut usually show a frayed end—often called a split end.
- Knowing the average rate of hair growth, investigators can gauge the age of a hair by its length.
- However, the age or sex of the person that the hair belongs to can't be judged with any confidence—except maybe for the very fine hairs found on the scalp of a baby. Even gray hair doesn't necessarily relate solely to a person's age.



LOOK AT HAIR UNDER A MICROSCOPE!



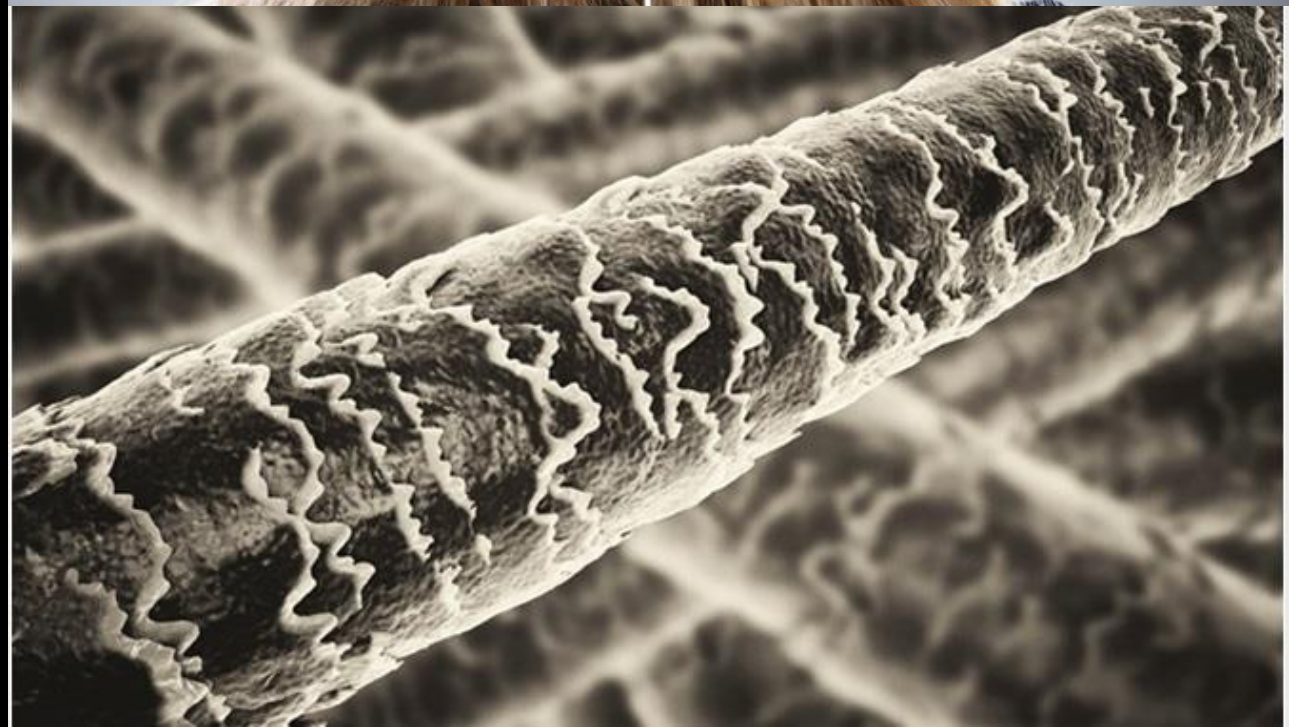
SCANNING ELECTRON
MICROSCOPE (SEM)



COMPOUND MICROSCOPE

HAIR COMPARISON

- Specific steps include: First, a questioned hair has to be identified among all the evidence at a scene, which can actually be difficult, and then the unknown hair has to be classified by type—such as head or pubic hair—and be assessed to determine which tests it's likely suitable for.
- Then, a representative group of known standards of the same type of hair—head or pubic—have to be taken from a suspect or someone who investigators need to exclude.
- If there are similar features, they should be noted before a microscopic exam. If there are not similar features, the comparison is concluded, and the report is issued. However, if the questioned and known hairs warrant a complete comparison, then they have to be examined microscopically.
- Using a side-by-side comparison microscope, detailed observations can be made using all of the features of the cortex and its pigment distribution as well as the medulla and its form.



HAIR COMPARISON CONTINUED

- An investigator has 3 options regarding reporting on the comparison between any 2 hairs.
- If there are no unexplainable differences and many commonalities between 2 hairs in question, a trace analyst may conclude that the 2 hairs could have come from the same person.
- If there are clear differences that go beyond the typical range of variation seen in a single person, then an analyst may conclude that the 2 hairs could not have come from the same individual.
- If there are both similarities and differences, then no conclusion can be made about a potential association between the hair in question and hairs taken from a known person.



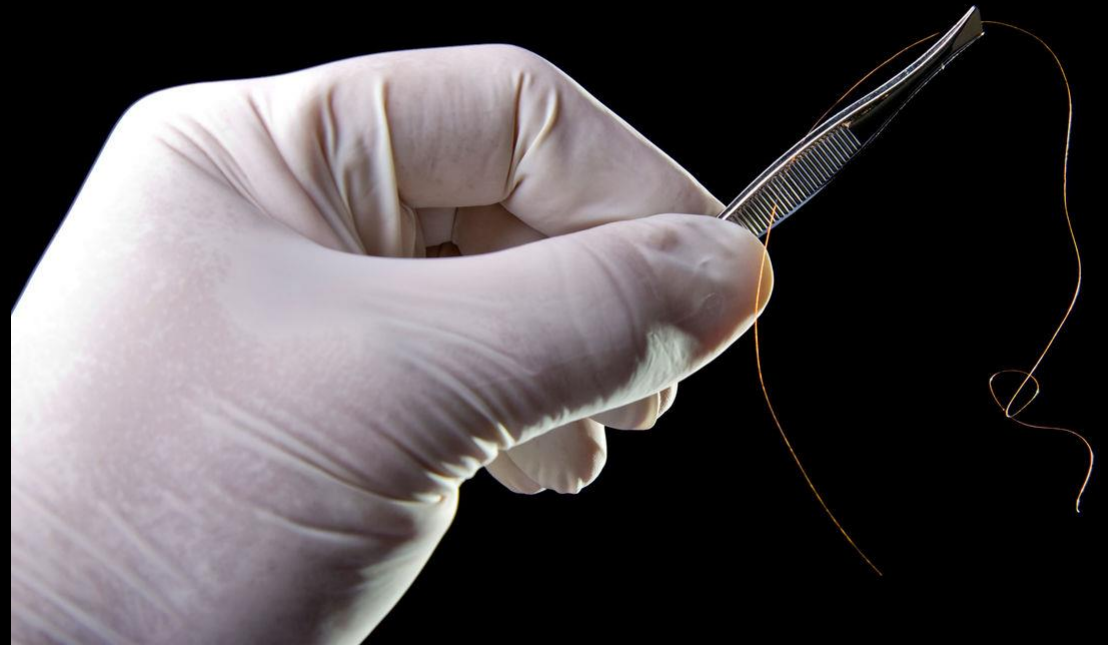
THE ROLE OF THE INVESTIGATOR

- Investigators have attempted to classify hair in much the same way that fingerprints are categorized, but human hair can't be fit into any reasonable number of classes to allow for discrete categories the way they've been able to do with fingerprints and genetic markers.
- Furthermore, when people change their hair—or as it changes naturally when they age—the hair changes class groups. This is different from fingerprints and genetic markers, which don't change as people age.
- To come up with a good hair standard for a single person, many known hairs are needed because even on the same person's scalp, any number of hairs might vary in diameter, length, and color.



THE INVESTIGATOR'S ROLE CONTINUED

- An investigator should collect at least 50 full-length, intact hairs—which means with the root—from the scalp of a single subject to serve as that person's known reference sample. Because of regional differences, these hairs should come from a variety of locations on the person's head.
- Similarities between hairs can be noted and dissimilarities between hairs can definitely provide exclusions, but there is currently nothing short of nuclear DNA technology to positively link a hair to a specific person.



Questions and Comments

**THANK YOU FOR YOUR
ATTENTION**