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IDENTIFICATION OF HAIRS AND FIBER REMAINS

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ABSTRACT

When seeking to link a suspect to something like a victim or a crime scene, trace evidence which including hairs and fibres may be quite helpful. Crime scene technicians, laboratory examiners, investigators, and prosecutors have significant interests in understanding how hairs and fibres might be transferred and which circumstances determine the importance of a hair or fibre match. Comparing the microscopic characteristics of the questioned hairs to known hair samples can help identify whether a transfer may have taken place. When it comes to hair, the types of hair recovered, the condition, and the number of hairs found all relate to their value as evidence in a criminal investigation. This article covers the architecture and growth of hair, the study of human hairs in forensic laboratories using light microscopy, and the analysis of both animal and human hairs collected from various body areas. There is a thorough discussion of the relevance of hair evidence. Since textile fibres may be transferred between two people, between a person and an item, and between two things, fibre evidence from textiles is important. Both the crime scene and the victim may include fibres from the suspect's clothing, and the suspect may also have fibres from the crime scene or the victim. The nature of fibre evidence, various fabric kinds and sources, fibre transmission and persistence, and the relevance of fibre evidence are all covered in this article. The article's conclusion includes a collection of hair and fibre evidence, instructions for managing evidence, examples from other instances, and a comparison of hair and fibre remnants.

INTRODUCTION

Direct physical contact between the victim and the suspect occurs in many crimes. There is virtually always an unintentional transmission of microscopic evidence whenever such contact takes place. Hairs and fibres are typically part of this transfer.

However, because they are difficult to see, investigating officers may frequently miss this sort of evidence, which can take the shape of minute objects. Hairs are durable, easily transferable,

and widely accessible. For associative and investigative objectives as well as to offer details for crime scene reconstruction, hair analysis may be employed. Although white and/or blue polyester, cotton, or mixtures of these are the most often observed fibres, this kind of evidence should still be gathered and submitted for analysis. Animal fibres, such as hair and silk, as well as vegetable fibres such as (Cotton and linen), minerals like asbestos, or synthetics like (nylon and polyester) can all be subclassified by laboratory analysis.¹

(1) demonstrating the connection between a suspect or a suspect and a victim and a crime scene,

(2) evidence that there is no connection between a suspect and a crime scene or a suspect and a victim. The vast amount of macroscopic and microscopic information available in hair analysis can provide a solid basis for a partnership and unquestionably offers strong exculpatory information, even though the science of microscopichair examination scan never be identified, meaning it can be concluded that one-person hair came from one individual, excluding all other hair examinations.²

TYPE OF CASES IN WHICH HAIR AND FIBER MAYBE OF VALUE AS EVIDENCE

ASSAULT AND HOMICIDE - These crimes often entail some form of intimate contact. As a result, the victim's and the suspect's clothes fibres and hairs may be switched; that is, the victim's fibers/hairs may be discovered on the suspect's clothing, and vice versa. Important forms of fibre evidence may also include scrapes left behind by weapons and fingernails. If a person was bound, bindings like rope can also leave unique fibres.

RAPE - The nature of this crime may cause fibres and hairs to be transferred between the clothing of the victim and the perpetrator as well as items like blankets or car seat coverings. The hair combings may be a reliable source of hair and fibre evidence if a victim has an examination at the hospital. Armed individuals and nail scrapings are potential sources for fiber-based proof.³

BURGLARY - At the spot where the burglar squeezed through a window or other hole or

¹ <https://blog.edvotek.com>

² <https://www.ilkouniv.ac.in>

³ <https://www.gov> , INDIANA STATE POLICE LABORATRY DIVISION

climbed over a fence, clothing fibres are sometimes discovered. Hairs could also be discovered if a head covering wasn't used.

HIT-AND-RUN - As a result of the victim's strong impact with the vehicle, clothing fibres and hair are frequently found stuck to the fenders, grill, door handles, or other areas of the undercarriage. On surfaces that the cloth comes into touch with, fabric impression patterns can also be seen.⁴

CASE LAWS

Investigations into crimes can benefit greatly from the use of hair and fibre. Hair and fibre have shown to be quite useful in a number of situations and cases for defining the extent of the crime scene, assisting the cops in making a connection, or guiding the investigation.

Hair and fibre analysis has been employed in a number of cases to help with the investigation or secure the conviction. The following are some examples of case laws:

GURA SINGH V. STATE OF RAJASTHAN⁵

Forensic science laboratory which found a hair to be of human head after examining the morphological analysis. Numerous other items were submitted to the Forensic Science Laboratory for examination, for example a bed sheet, turbans and pair of shoes.

The hair was contrasted to that of the body of his department and it was considered from the examination to be appropriate to say and link the criminal with the criminal activity on which he had been correctly charged that the human hair and the sheet had been contaminated with blood. Hair was seen as an important element in this trial which supported the detective, and the lawsuit was thus dropped.

In a suspected murder, in which two woman's carved bodies had been discovered in the ruins of their houses that had burnt to the ground, officers investigated some half-branded clothing, some partially sung hair and a number of other fragmentary items. Substantial blood in unburned parts of the fabric was discovered, but since it was at a very high temperature, the corpuscles could not be recovered adequately to determine whether or not the animals were in

⁴ <https://dfs.dc.gov>, district of Columbia department of forensic science

⁵ Gura singh v. state of rajasthan: 1984 CriLJ 1423

the home at the time of the burning.

In case a husband is accused of hammering at his wife, it would generally be of little value to locate a hair on a hammer that may be connected microscopically to the victim. Nevertheless, the association's importance increases considerably if the hair itself displays microscopic features of being compressed or damaged. Similarly, it should not be uncommon to discover hairs microscopically linked to a deceased in the trunk of her wife's car because those hairs showed signs of decomposition and indicated they had been deposited sometime after death.

STATE OF M.P.V. DALSINGH AND ORS⁶ -

The respondents in their statements under section 313 Cr.P.C. denied their presence at home at the time of incident, taking the plea that they had been working in their agricultural field. They had rushed to the place of occurrence only after learning about the incident. They further took the defence that Kusumbai had committed suicide by burning herself, and that it was on being tutored by her parents that she had given a dying declaration against them. The trial court however, rejected the suggestion made by Mannu Singh (PW.5), to the effect that Kusumbai had caught fire while preparing food on the ground. Kerosene oil had been found on her body and in her burnt clothes and hair. Evidence has been led by the prosecution witnesses to the extent that she had died within a short span of 10 months of her marriage, and that she had been ill-treated by her parents-in-law as she was not being given proper food etc. She had been harassed and tortured by her in-laws, as she was not good looking, could not cook well, and had been unable to do household work properly. She was considered to have a temperamental nature, and thus had also been slapped. This evidence has not been challenged by the defence.

Ted Bundy Case⁷

Ted Bundy was a serial killer that is responsible for an estimated 30-plus murders. However there was not much physical evidence to connect him to the crimes when he was arrested in 1975. He was only convicted for kidnapping, but two years later he escaped and headed to Florida. He then killed three more people in 1978, and was finally captured in February of that year. The physical evidence in those cases was key to his convictions. He was convicted of the murder of 12-year-old Kimberly Leach based on fibers found in his van that matched the girl's clothing. Bundy was put to death in 1989

⁶ AIR 2009 sc 2303

⁷ Ted bundy, 479 U.S. 894 (1986)

Collection procedure (fiber)

1. When visible and firmly connected fibres are present on an inanimate object being carried to the lab:

Keep the fibres whole.

- (a) Draw a diagram, noting the precise location and roughly how many fibres are adhered to each object. (Take a snapshot if you can).
- (b) Label the item and package it in a container to prevent fibres from becoming loose while being transported.
- (c) Provide the necessary information on packing labels.

2. If fibres are visible but not securely fastened, or if they are securely fastened but the object is too big to submit to the lab:

- (a) Carefully remove with clean tweezers and packaging after diagramming and documenting each area's position and the amount of fibres that are there.
- (a) Put the fibres in a little pillbox, a glass vial, or another container that can be snugly closed. Furthermore, fibres can be inserted into tiny, folded paper bindles.
- (c) Provide the necessary information on packing labels.

3. In situations where fibres may be transmitted to the victim's or suspect's clothes,

- (a) make sure the clothing is dry before packing.
- (b) Keep everything apart.
- (c) Refrain from removing any foreign substances stuck to clothes, including filth, dust, blood, seminal stains, and others.
- (d) If any of the aforementioned conditions apply, special instructions can be found in the relevant Evidence Submission Guideline.
- (f) Attach an ID tag to each item in a visible location that won't harm the apparel.
- (f) After allowing wet clothing to dry naturally, carefully fold and wrap each item separately, package, and label with the necessary information. You can use fresh paper bags and layers of wrapping paper for this.

4. For fingernail scrapings or trimmings:

- (a) Collect scrapings or trimmings from the victim and the suspect.
- (b) Use a clean knife, clippers, or other tool, such as a toothpick or fingernail file.
- (c) To gather scrapings/clippings, use a separate, folded paper bundle for each hand.

(d) Pack the "left hand" and "right hand" bindles, which have been folded and tagged, in a pill box, glass vial, or another compact, tightly-sealed container. Label the container with the necessary information.

5. Use a clean, fine-tooth comb to comb the suspect's or victim's hair over a clean sheet of paper where fibres were found in the hair. To avoid losing any trace evidence, carefully fold the paper with the comb and combings into a binder. Put the bindle in an envelope and label it with the necessary details.⁸

Collection of hair

1. Take a picture of the hair in situ, along with any substrate it may have.
2. Put on a fresh pair of latex or nitrile gloves.
3. If hairs are visible, you should gather and bind them right away to reduce the possibility that they will fall out when the object is moved (see step 5 for collection and packaging of hair). The object should then be collected if it can be carried in its whole so that the laboratory may check it for more hairs or other traces of evidence.
4. Prepare proper packaging that is big enough for the object once the hair has been gathered (see step 5), and mark it with your name, the case number, the date, the exhibit number, a brief description, and other identifying information. Place the object with care in the

5. The method described below should be used to harvest hairs from a substrate:

Use clean or disposable tweezers to carefully remove the hair from the substrate in order to capture any visible hairs. When removing the hair, take care not to damage or crush it. Put the recovered hair on a fresh piece of paper or Post-it® note, being careful not to wrinkle the hair in the fold. Post-it notes are helpful for collecting hairs since the hairs are softly held by the adhesive. Put the folded paper inside an envelope with the appropriate label (case number, date, exhibit number, a brief description, and your name)⁹

COLLECTION OF FIBER AND HAIR STANDARDS FOR COMPARISON

FIBER STANDARDS: The investigating officer may not always be aware of the presence of fibres in the offered evidence. Because of this, caution must be taken while handling any object that can lose fibres and lead to cross-contamination between objects belonging to suspects and

⁸ Sally Robertson, BSC, <https://www.news-medical.net>

⁹ Ayushi Soni (September 2020), <https://indianlawportal.co.in>

victims.

Once the investigation team has gathered the fibres, it is crucial to present proper and sufficient standard samples as well. Standard samples of the carpet or carpets at the crime scene should also be provided, for instance, if fibres are discovered on the soles of the robbery suspect's shoes. Variations owing to colour, style, kind, fading, or staining should be included in the standard samples, which should be a representative sampling. Standard samples must be supplied, and their minimum size is a quarter.¹⁰

HAIR SAMPLE STANDARDS: The roots should always be included when collecting hair since they contain a wealth of information.

SCALP OR HEAD HAIR The hair should reflect the front, back, and centre (including nape of the neck), and the scalp on both sides. 50 head hairs or so should be gathered. The sample should consist of hairs that have been plucked and combed, as well as any differences in colour and length. Other facial hairs, such as sideburn or beard hairs, should be packed individually if they are gathered.

PUBIC HAIR: When the situation warrants it, gather pubic hair. 30 to 40 pubic hairs should be gathered. In the same way as was previously stated, the sample should be collected and packed.

Animal hair should be combed and pulled; in some cases, the roots of the hair are essential for species identification. Notwithstanding the difficulty of establishing a minimum quantity of hairs, good judgement should be utilised to gather enough hairs to accurately depict the various types and colours of hairs found on the animal. The animal's hair needs to be harvested from a variety of places, such as the head, back, belly, tail, etc. Each sample has to be packed separately and marked with the part of the body it came from.¹¹

POSSIBLE RESULTS FROM LABORATORY ANALYSIS OF HAIR AND FIBER EVIDENCE

1. Fibres

a. Classification and sub-classification of fibres (e.g., polyester, nylon, acrylic) as either

¹⁰ Aparna Rand Yadav SK, International Journal of Scientific & Engineering Research, Volume 4, Issue 11, [November-2013, https://www.ijser.org](https://www.ijser.org)

¹¹ <https://www.gov.in>, INDIANA STATE POLICE LABORATORY DIVISION

synthetic, animal, vegetable, or mineral.

b. Determining whether the fibres in question are the same kind and colour as the standard.

determining if the microscopic properties of the questioned and standard fibres are identical.

(Note: Due to various variables like wear or fading, the colour and microscopic features of fibres may differ inside a garment, carpet, drape, rope, etc.)

c. The commonness or rarity of the fibres.

d. A conclusion as to whether the standard and the questioned fibres might have come from the same source.

2. Hairs

a. From an animal or a person

b. If a person:

1. The originator's race is conceivably involved.

2. The bodily part from which the hair grew (i.e. head, pubic, body).

3. Perhaps how the body's hair was removed (e.g. naturally, forcibly removed).

4. If hair has been changed by bleaching, dying, or cutting.

5. If the hair in issue might be related to a certain hair standard in terms of origin. when there are no discernible macroscopic or microscopic variations between two samples of hair. The ideal scenario is to discover one or more hairs in the known sample that completely match the questioned hair (with no obvious variances).

6. If the questioned hair cannot have a common ancestor with a certain hair standard. When there are noticeable variations between the macroscopic and/or microscopic traits displayed by the questioned and known hairs, the questioned hairs cannot be linked to the origin of the known hairs.

7. A microscopical hair comparison may yield equivocal findings. An inconclusive result may be obtained in the following circumstances, but they are not limited to them: an insufficient known hair sample, questioned and known hair samples that show similarities and unexplained differences, and hairs that do not exhibit enough distinguishing microscopical characteristics (e.g., broken, fragmented, too short, colorless, opaque).¹²

¹² Doctor Dennis J.Nicholas Institute of Forensic Science, NDIANAPOLIS-MARIONCOUNTYFORENSIC SERVICES AGENCY