

HUMAN HAIR: A STRONG FORENSIC EVIDENCE

Abstract:

Microscopic analysis of human hair can be a powerful evidence in the field of forensic science. Examination of different characteristics of hairs under a microscope are studied usually for comparing hair taken from a crime scene and hair taken from a suspect. Hair found can link the crime scene to the suspect and a victim. The visual characteristics of hair are observed as color, length, texture and type. In microscopic analysis, more detailed hair characteristics are noticed that finally help to establish a correlation between a suspect and a crime scene or a suspect and a victim. [1, 2]. When the hair is present with the root follicle than DNA profiling can be done but if hair is present without root follicle than profiling is done by mitochondrial DNA.

INTRODUCTION:

Human hair is important physical evidence found on violent crime scenes such as homicides assaults, sexual offences, road accidents etc. According to Locard's Exchange Principle hairs most frequently get transferred from one person to another or on cloths, weapon, and vehicles or at the crime scene due to contact. Hairs help in linking the victim with the culprit, his weapon of offence, the vehicle used in commission of crime and the crime scene. The racial origin of the deceased person can be identified whether Mongoloid, Caucasoid or Negroid. Hairs can also be determined as the human hair or the animal hair as the genus of animal from which hair originated can be established. In situations where the hair is present with the root follicle then DNA profiling is done to individualize the source and if the hair is present without the root follicle then mitochondrial DNA profiling is performed.

Hair is a fibrous outgrowth from the skin of mammals which grows from pillae situated in the dermis or true skin. A hair consists mainly of three major parts; the cuticle, cortex and medulla.

Cuticle:

The outermost part of the hair is known as the cuticle. Cuticle is formed from the dead cells which overlap in layers to form scales that strengthen and protect the hair shaft. There are different scales patterns present on the outer layer of the hair which are different in human and non-human hair. Various scale patterns like coronal (simple, serrate, dentate) , imbricate scales (ovate, acuminate, elongate, crenate, flattened) , spinous scales etc.

Simply the hairs were placed on the glass slide and applied dark colored nail paint on the hair. After drying the hair was pulled off to make the scale patterns visible under the microscope at 10x, 40x and 100x.

Medulla:

In present time the classification proposed by Wynkoop is followed and as such four medullary types are identified as follows:

(1) Absent: where the medulla is absent all throughout the length (25 mm) of the strand.[3]

(2) Scanty: this type shows only a few patches of medullary column here and there.[3]

(3) Broken: where a discontinuity or breakage in the medullary column is observed.[3]

(4) Continuous: as the name implies, in this type the medulla should be continuous or unbroken throughout the length of the strand. But in the present study, the medullas with one or two breaks are also included under the heading 'continuous'. However, a separate column for this second category of continuous medulla is made. [3]

The thickness of medulla is also noted. For this purpose, a threefold classification is made: narrow, medium and thick.[3]

(1) Thick: when the diameter of the medulla is one-fifth or more of the total diameter of the hair.[3]

(2) Medium: when the diameter of the medulla is between one-fifth and one sixth of the diameter of the strand. [3]

(3) Narrow: a medulla with a diameter less than one-sixth of the diameter of the hair. [3]

Cortex:

The cortex of hair lies between the cuticle and the medulla also it is the thickest layer of the hair. The color and texture of the hair is due to this layer as most of the pigments lies in cortex layer of hair. Melanin pigment is found in the cortex which is found in the skin. The distribution of melanin pigment is different in different species of animals. In humans, the melanin is primarily denser nearer the cuticle whereas in animals, melanin is primarily denser nearer the medulla.the cortex of hair provides strength an length to hair.

Application:

Hair found on the crime scene can help to investigate a number of things to be analyzed. The clues that hairs reveal include does the hair present is of animal or human, if human what part of the body the hairs came from, if the shed the race of the person from where they came from can be determined, if the hairs shed naturally or were pulled from someone's head during some struggle or contact, whether the hairs were cosmetically treated.

REFERENCE:

1. Homan JA, Genoways HH (1978) An analysis of hair structure and its phylogenetic implications among heteromyid rodents. Bull Am Mus Nat Hist. 50
2. Karen A, Lanning, Michaud AL, Bisbing RE, Springer FA, et al. (2009) [Scientific Working Group on Materials Analysis Position on Hair Evidence. J Forensic Sci 54: 1198-1202](#)
3. Medullary structure of head hair in some caucasoid and mongoloid populations of Assam, Bhuban M. Das Source: Zeitschrift für Morphologie und Anthropologie, Bd. 63, H. 1 (Juli 1971), pp. 102-109 Published by: E. Schweizerbart'sche Verlagsbuchhandlung Stable URL: <http://www.jstor.org/stable/25755942> Accessed: 28-01-2016 09:52 UTC .
4. Jitendra Gharu, Seema Trivedi. Comparison of cuticle scale patterns, medulla and pigment in hairs of domestic goat, sheep, cow and buffalo from Rajasthan (India)