SPECIES IDENTIFICATION THROUGH MORPHOLOGICAL FEATURES OF ANIMAL HAIR - A METHOD FOR SPECIES IDENTIFICATION IN WILDLIFE FORENSIC CASES

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Abstract:
Hair is the most common biological evidence found at the crime scene. It varies between different species and the study of the variations found on the morphological characters can be effectively used by forensic scientists to identify hair in illegal transport of animals, poaching and trafficking of endangered animal species. For the purpose of forensic investigation the main morphological features like cuticle, cortex and medulla are considered. Study of hair diameters, color, shaft, cuticle pattern and medulla can reveal many important and distinctive characteristic features for individual identification of different animals from different species. Therefore, we presented here the data on various morphological features of animal hair to identify the species in wild life forensic cases.
Key Words: Animal, Hair, Species, Morphology & Identification

Introduction:
Evidences or traces of animal hairs are frequently found at crime scene. Pet or other animal hairs can be found on the garments of the victim or on different things of physical proof gathered at the crime scene. The recognizable proof and examination of human and animal hairs from a crime scene can demonstrate physical contact between the victim and a suspect, or give other investigative leads. Exchanging of pet hairs to the victim, to a suspect, or to the crime scene may happen when the culprit is a pet proprietor (or when the victim possesses a pet), or when the crime was committed in a place where animals are kept, for example, outbuildings, stables, barns, or transport vehicles [1]. Measurable hair examination is a logical technique for breaking down follow proves from a crime scene. It includes inspecting the hair shaft, including its medulla (internal center), cortex (transitional layer) and cuticle (outer covering) through effective magnifying instruments. Hairs confirm must be gathered appropriately and dissected by conventions. The initial step of the examination includes checking whether the hair being referred to is that of a human or an animal. In the event that the hair is from an animal, the analyst can possibly distinguish the species from which it began [2]. Hair can be moved from area to area by physical contact, the nearness of a particular individual's hair can interface a suspect or a victim to a crime scene. Exchange of hair is extremely regular with animal hairs, which are generally found on pet proprietors and can be utilized to connect suspects to crime scenes. In hair, from animals, the width of the medulla is bigger than a large portion of the distance across of the whole shaft. Animals deliver diverse sorts of hair. They regularly have coarse monitor hair outside to gentler hide hairs. They likewise deliver stubbles and longer hairs in such places as the tail and mane [3].

Methodology:
The hairs were gathered from the sheep hair, goat hair, bear hair, buffalo hair, deer hair, Doberman dog hair, dog hair, emu hair, flamingo feather, Labrador dog hair, tiger hair from Maharajbagh zoological park, Nagpur, Maharashtra, India. Hair samples were collected by using wide, transparent sticky tape lint roller. Hairs were cleaned and degreased in 70% ethanol and further explored by light microscopy. The samples were analyzed using a light microscope equipped with a video camera and connected to the image-analysis and morphometry system [4]. Microphotographs were brought with a digital camera at 20x or 40x amplification. Morphometric examination of hair shaft, medullary width, cortex thickness and medullary vacuolated cells at minimum 10 estimations were performed in every hair test. Cuticle scales were explored by the quick nail polish technique hair shafts were embedded in a thin coat of clear nail polish applied on a glass microscope slide and when the polish surface was dried, the hair was removed leaving the scale covering on the slide [5]. The normal separation between two sequential scale edges (scale length, SL) and the scale pattern were also microscopically evaluated. Medulla pattern: Medullary record Human hair for the most part < 1/3 Animal hair >=1/2 Medullary shape Human =normally cylindrical Animal =varies by species.

Results:
In the present study the characteristic features of different species observed during microscopic examination on collected hair samples are shown in the tables given below:

Table 1: Characteristic hair features of Cow

S.No	Characteristics Feature	Description
1	Scales	Imbricated and with no protrusions from hair shaft
2	Root	Elongated medullary structure continuous into root area, traces of follicular tissue may be present
3	Unbanded:	Ovoid structures abundant, pigment coarse
4	Medulla	Diameter coarse Medulla absent or continuous, amorphous or vacuolated, width may be narrow to very broad

Table 2: Characteristic hair features of Manipuri deer

S.No	Characteristics feature	Description
1	Measurement of hair to tip	Deer hair is about 300-1000 micron meter wide from the root to near the tip
2	Medulla	Lattice type medulla that nearly fills
3	Cuticle patterns	Imbricating flattened to broadly acuminate and has a scale count about 3-7/100 micron depending upon the scale pattern.
4	Refractive Index	Length of about 1.56 and perpendicular to its length of about 1.55.
5	Diameter	Very coarse over all diameters (approximately 300m)
6	Root	Regular, wave or crimp
7	Scale margins	Round and isodiametric and resemble fish scales.

Table 3: Characteristic hair features of Goat

S.No	Characteristics Feature	Description
1	Medulla	Unbroken lattice, occupies nearly entire width of hair shaft
2	Scales	Imbricate (absence of characteristics scales shapes)
3	General information	The angora breeds of goat produces long, lustrous lock of mohair on the surface. The Cashmere goat produces a commercial quality of cashmere wool,

Table 4: Characteristic hair features of Wild Buffalo

S.No	Characteristic Features	Description
1	Scientific name	Bison bison
2	Common name	Bison
3	Diameter	Coarse, range from 21-110 micron
4	Medulla	Continuous, amorphous or vacuolated, with may be narrow to very broad
5	Scale	Scale: imbricate and with no protrusions from hair shaf
6	Unbanded	Ovoid structures abundant, pigment coarse. Root; elongated, medullary structure continuous into root area, traces of follicular tissue may be present

Table 5: Characteristic hair features of Tiger

S.No	Characteristics Features	Description
1	Diameter	Fine , little variation
2	Medulla	Uniserial ladder (fur hairs), continuous, occasionally vacuolated in coarser hairs
3	Scales	They are not so prominent, may be banded

Table 6: Shows characteristic hair features of Wild dog

S.No	Characteristic Features	Description
1	Diameter	Fine to coarse (usually coarser than cat hair): diameter may vary to give short hairs a barrel-like appearance
2	Medulla	Continuous, vacuolated to amorphous, occasionally very broad
3	Scales	Generally not prominent
4	Unbanded	Pigment occasionally very coarse and extending into roots

Table 7: Characteristic hair features of Labrador breed hair

S.No	Characteristic Features	Description
1	Medium Diameter	(75-150) micron.
2	Medulla	Generally amorphous, moderate diameter variation in single hair
3	Diameter	Fine to coarse (usually coarser than cat hairs); diameter may vary to give short hairs a barrel-like appearance
4	Medulla	Continuous, vacuolated to amorphous, occasionally very broad
5	Scales	Generally not prominent.
6	Unbanded	Pigments occasionally very coarse and extending into root

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Discussion:

Minute examination of some animal's hair was performed and the preparatory information got in this review give a helpful tool to the scientific distinguishing proof of the analyzed species. The examination strategy utilized in the present study is fast and cost effective. Particular distinguishing proof can be performed on the hair, since its structure is the most part very normal and all parts (cuticle, cortex and medulla) are effectively observable. The hair shows certain microscopically features, which can be related with the origin of known hair or might be with the comparable breed. The hair can display both likenesses and slight contrasts and no conclusions can achieve cubicula scales can be found of various structures and measurements. We can utilize different attributes to recognize animal hair pigmentation, shaft diameter, scale pattern, modularly example and root shapes give important information to particular identification of animal hair. Numerous scales are found in animal hair, these patterns give information to particular recognizable proof of animal hair. The size, shape and pattern arrangement on the hair provides distinctive characteristics for certain animals. The medulla is an essential feature, this portrays the nearness of medulla along the hair shaft, absent, continuous or discontinuous or several terms used to describe the medulla distribution. Hairs are biological sample and subjected to variation, in this we need to found the variety in the specimen. The possibility cannot be dismissed that there may be two hair samples whose range of variation overlap and distinguishing between the samples is not possible [6]. In light of our study, wild animals had a large hair diameter than the domestic ones. No significant contrasts were seen between the wild investigated species, depending on the species, the scale shape and the layout of their edges demonstrate a few particularities. In the wild Animal's the scale is constantly longer than that one found in the domestic species. This distinction could be utilized as a valuable character in species identification.

Conclusion:

Hair is a useful tool for the forensic identification of the examined species. The investigation method employed in the present study is rapid and cost effective. Specific identification and individualization can be performed from the hair samples in wild life cases. The size, shape and pattern arrangement on the hair provides distinctive characteristics for animals and can be utilized for routine analysis.

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