



## **Comparative trichological analysis of common domestic mammals of Jabalpur district**

**Dr. Parnashree Mukherjee \*, ChhayaPasi , Saraswati Patel and Surbhi Dhurwey**

Department of Zoology, St. Aloysius College(Autonomous), Jabalpur.

\*Corresponding author: [parnashree\\_muk@yahoo.com](mailto:parnashree_muk@yahoo.com)

### **Abstract**

The main objective of the present study is to provide a comparative account of the hair structure of domestic mammals of Jabalpur district for identification and to explore the biodiversity of domestic mammals on the basis of hair morphology. The project also seeks to investigate the microscopic differences in hair of domestic mammals with special reference to notable differentiation in medullary and cuticular pattern of hair.

**Keywords:** Domestic mammal hair samples, medullary pattern and cuticular pattern.

### **Introduction**

Hair identification is modern and exceptional method of information and the technique is also very simple and fast. Hair is generally used as a class characteristic and not an individual characteristic. Mammalian hair shows some age, gender and population variations in micro-morphological variables which have the potential of being useful for study of animals, anthropological and forensic investigations. In the present study a cross-sectional sample of hairs drawn from neck and tail of domestic mammals of Jabalpur district were examined for differences in the cuticular and medullary patterns. The morphology of the tail and neck hairs of domestic mammals were studied using light Microscop(40X and 100X) and compared with pre-existing data of other domestic mammals. The present study was done to provide the investigators a rapid visual comparison for unknown hair samples with a series of photographs of actual microscopic field and detailed description of hair samples taken from identified mammal species.

### **Materials and Methods**

#### **Collection of samples**

Hair samples included in this study belong to cow, buffalo, goat and rabbit [herbivores] and cat and dog [carnivores] from 02 different regions of the animal body that are neck and tail. About 10- 15 tufts of hair were collected from both the regions of the animals for further study.

#### **Hair profile study**

#### **Gross Microscopic Examination**

In the microscopic examination, each hair specimen was examined by transmitted light at 40 X and 100 X magnification as follows –

#### **Preparation of slide for microscopic studies of medullary pattern**

##### **1. Processing of hair**

For obtaining good quality slides the hairs were cleaned and made greasefree.

They were washed in 1-2% detergent water for 6-8 hours, rinsed in water and distilled water, allowed to react with 70% alcohol for 12 hrs, then placed in acetone for overnight, followed by clearing with xylene for 12 hours. (Teerink, 1991)

## 2. Positioning of hair in the slides

The hairs were placed flat on the slide for study of medulla. A drop of xylene was placed on the hair and then covered with coverslip.

## Preparation of slide for microscopic studies of cuticular parameter

For assessment of scale pattern, the cuticular impressions were prepared as described by Teerink, 1991 and Kitsos et al. 1991.

**Procedure** -10 gm gelatin was dissolved in 100ml of boiling water. Once the gel was formed, a thin layer spread on a clean glass slide. The hairs were placed superficially over the gelatin layer and were allowed to cool for about 2-3 hours. The hairs were then removed and the patterns of cuticular impressions were studied under the light microscope.

## Results and Discussion

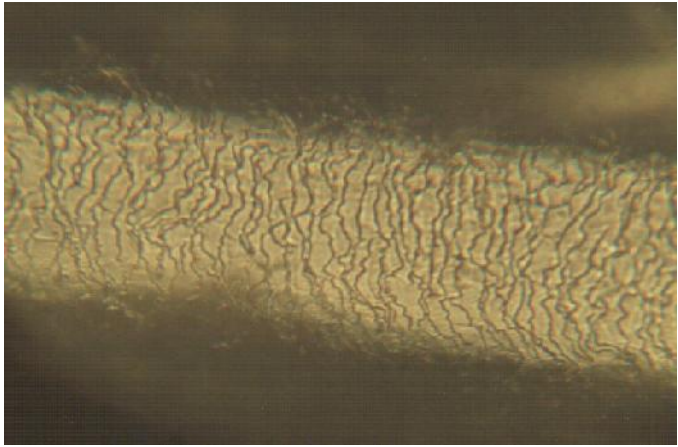
In the present study, the cuticular and medullary patterns of both herbivore and carnivore domestic animals were assessed by observing the margins and inner core of mammalian hairs. Among the different mammals cuticular and medullary patterns vary with length of the hair. The cuticle of domestic buffalo (*Bubalus bubalis*) hair appeared as clearly imbricated, irregular and rippled structure while its medulla appeared to be wider and thick, brown and solid than that of cow under transmitted light. Buffalo (*Bubalus bubalis*) hair medulla is dense, continuous, simple, straight or irregular (with scattered appearance at places but with less scattering compared to cow medulla), broad (wide) occupying almost entire width of the hair and has a straight continuous margin. (Jitendra Gharu, Seema Trivedi, 2015). The medulla of domestic cow (*Bos indicus*) appears dark but thinner than that of buffalo while the cuticle or scale pattern appears to be crenated. These observations indicate both cow and buffalo scales are similar in having rippled to crenate scales and irregular wave and imbricate pattern of margins. The only difference between cow and buffalo scales is the distance between scale margins. The cuticular margins of domestic goat (*Capra hircus*) hair appeared as imbricated, mosaic, irregular wavy and transverse and with flattened scales. Medulla of goat showed a central core of cells and some hair samples appeared

as black structure under transmitted light and some as white structure under reflected light. Domestic rabbit (*Oryctolagus cuniculus*) hair cuticle showed an imbricated elongated pattern and triangular spinous and petal-like scales that protrude from the hair shaft while the medulla was found to be thin. The cuticle of domestic cat (*Felis catus*) tends to be very densely crenated or imbricated, toothlike and prominent over the main part of the shaft for both tail and neck hairs and also have a relatively wide medulla. Most of the domestic dog (*Canis familiaris*) hair samples showed clearly imbricated cuticular patterns and vacuolated medullary patterns. However, both herbivore and carnivore hair patterns can be easily demarcated on basis of cuticular and medullary patterns. In the present study, no differences in medullary and cuticular patterns were seen in the hairs of male and female domestic mammals. Similar observations were made by Jitendra Gharu and Seema Trivedi, 2015. Detailed knowledge of the hair structure is required to identify the species, where morpho-taxonomy cannot give the fruitful result. Physical characters, surface structure and medulla of guard hair may help in species identification (Chakraborty & De, 2010; Sahajpal et al., 2010, Kamalakannan & De, 2013, etc.). Now-a-days, the tricho-taxonomy is an important tool used in the field of forensic, criminology, food-habit analysis, etc. The Zoological Survey of India is a premier organisation in the field of animal taxonomy in India and it has already invented method of tricho-taxonomy for identification of mammalian species from small part of skin, brushes, bags, wallets, etc. (De, 1993; Venkataraman et al., 1994; Chakraborty & De, 1995, 2001, 2002, 2005 & 2010; De et al., 1998; Bahuguna, 2008; Sarkar, 2011, Kamalakannan & De, 2013, etc.) Tricho-taxonomical works on different mammals orders; Carnivora (Chakraborty & De, 2010), Primates (De, 1993; Sarkar et al., 2011), Rodentia (Bahuguna, 2008) have been done and few works on hairs of Artiodactyls except the studies of De & Chakraborty (2013), Joshi et al. (2012) and Keogh (1983) were recorded in India.

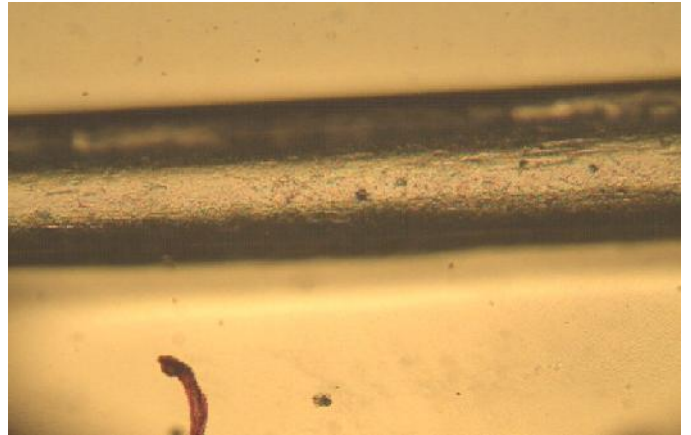
## Conclusions

The present study concludes in general that the variations in hair pattern of domestic mammals were as a result of genetic and environmental interactions. The observations during the present study suggest that cuticular and medullary patterns of all the domestic mammals studied were found to be different and can serve as an important tool for their identification.

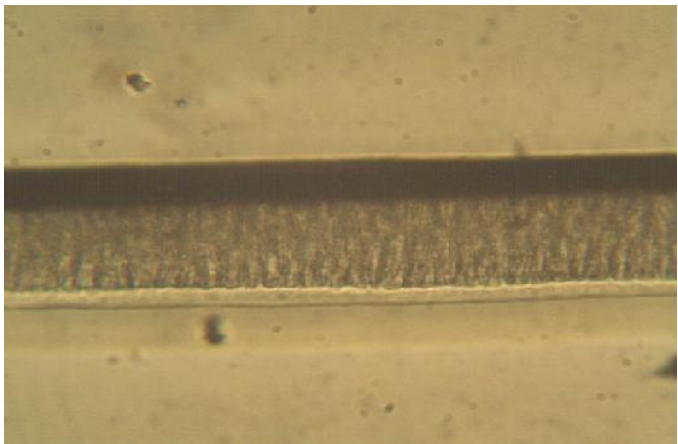
Figures showing light microscopic view of cuticular patterns of different hair samples of domestic mammals



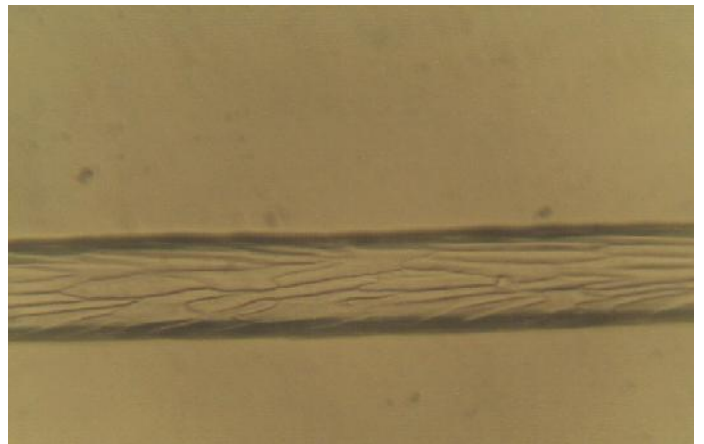
**Fig -1 Buffalo cuticle**



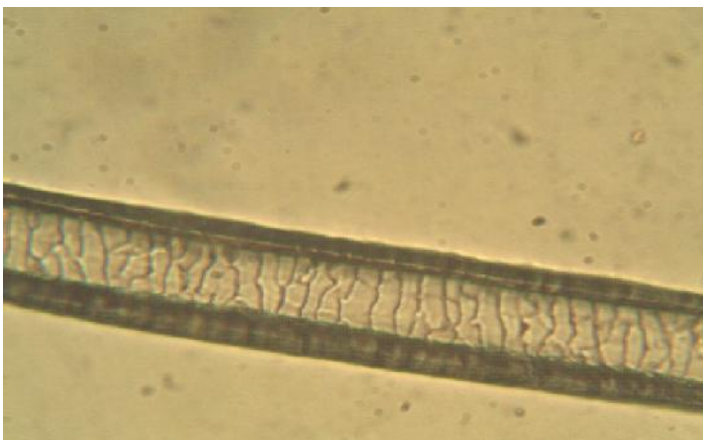
**Fig -2 Cow cuticle**



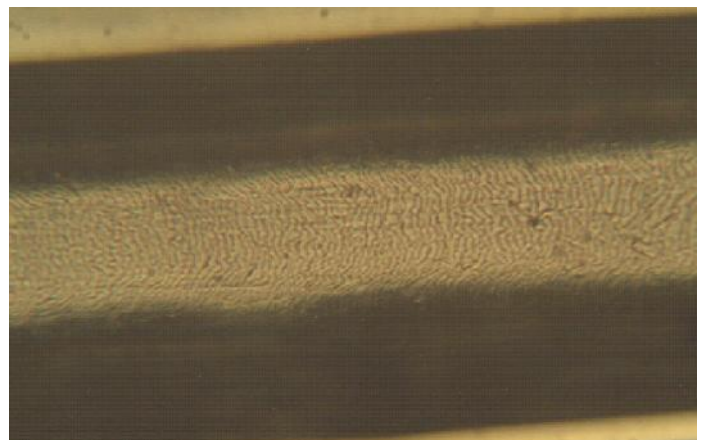
**Fig -3 Goat cuticle**



**Fig -4 Rabbit cuticle**



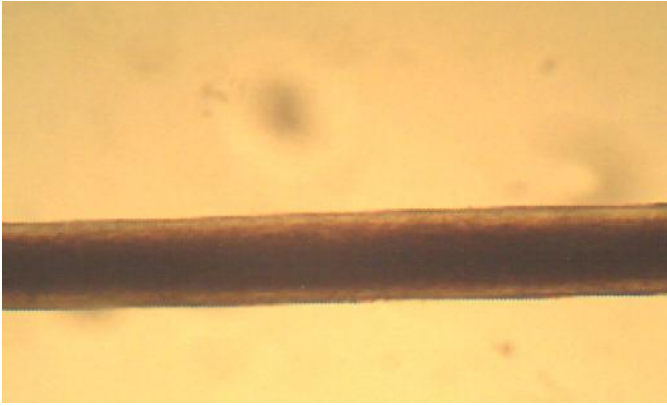
**Fig -5 Dog cuticle**



**Fig -6 Cat cuticle**



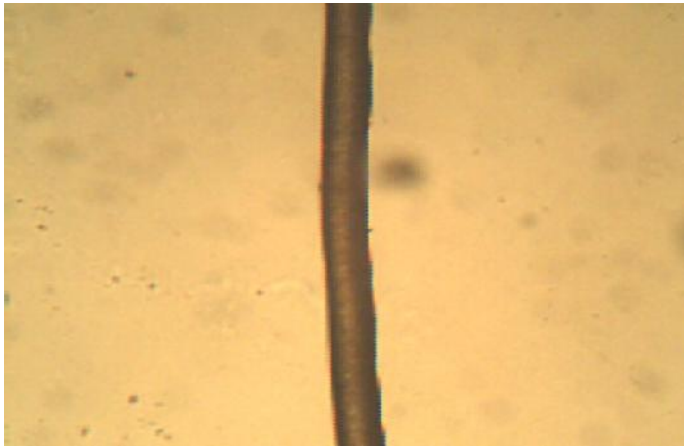
Figures showing microscopic view of medullary patterns of different hair samples of domestic mammals



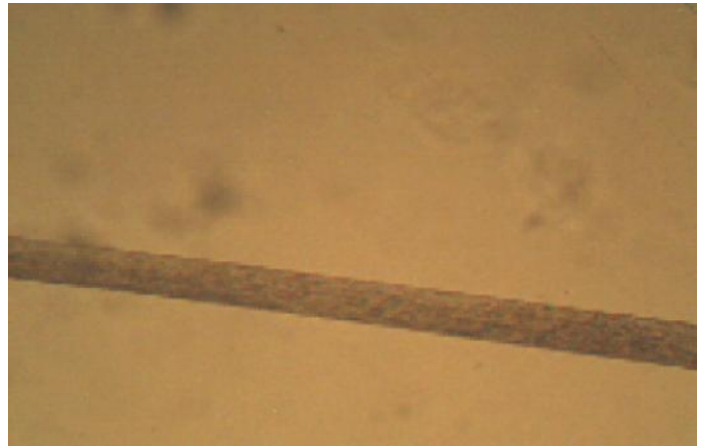
**Fig -1 Buffalo medullary pattern**



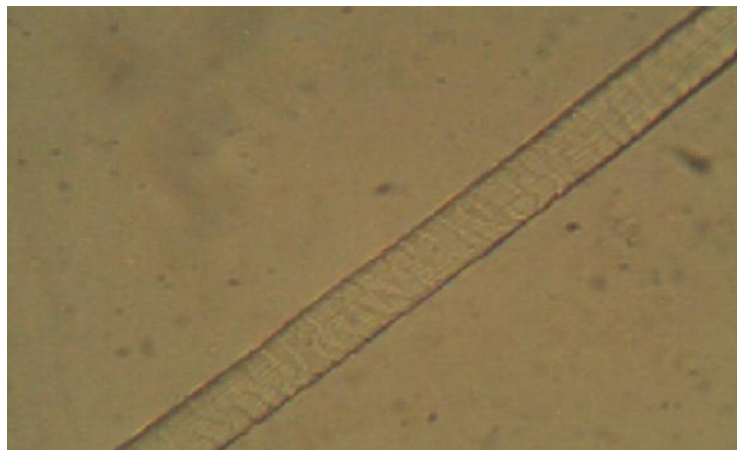
**Fig -2 Cow medullary pattern**



**Fig -3 Goat medullary pattern**



**Fig -4 Cat medullary pattern**



**Fig - 5 Dog medullary pattern**

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