

Inter-species relationship of Presbytis Monkeys based on Hair Medulla Structure

M. Chatterjee¹ and A.R. Bandyopadhyay²

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¹Madhumati Chatterjee, *PhD*, Department of Anthropology, Sarojini Naidu College for Women, Kolkata, India. Email: madhumati.cu@gmail.com

²Arup Ratan Bandyopadhyay, *M.Phil., PhD*, Department of Anthropology, University of Calcutta, Kolkata, India. Email: arup_cu@rediffmail.com

Corresponding author: Madhumati Chatterjee, Department of Anthropology, Sarojini Naidu College for Women, Kolkata, India. E-mail: madhumati.cu@gmail.com

ABSTRACT

Microscopic examination of the hair medulla was performed on Presbytis monkeys in 6 species. To achieve the purpose 750 hair strands has been taken into consideration. Their medulla can be roughly divided into two types (discontinuous and absent) relative to the structures. Medulla structures revealed similar pattern (absent) among the Presbytis entellus entellus and Presbytis cristatus cristatus, while Presbytis rubicundus and Presbytis senex nestor were found to have only discontinuous medullation pattern. Interestingly, Presbytis johnii, and Presbytis phayrei phayrei demonstrated both the discontinuous and absent medulla pattern but examination on medullary pattern revealed significantly ($p<0.05$) higher discontinuous medullation among Presbytis phayrei phayrei in comparison to Presbytis johnii. In view of the result of the present study emphasize variation in medullation status in Presbytis johnii, and Presbytis phayrei phayrei than other four species of Presbytis Monkeys.

Key words: hair, medulla, variation, Presbytis monkey

INTRODUCTION

Hair is an important character found in all mammals. Like other organs and parts of animal body, hair has also a range of diversity and the microscopic details of hair strands offer certain definite and variable features as well. Though hair strands look as singular fibers, each hair is constructed in three different layers: the medulla, the cortex and the Cuticle. These are found to be useful for the purpose of identification. The medullary canal is a hollow or partially hollow shaft which appears in some hair strands. Medullary channel is partially filled with a spongy hornlike substance displaying sizeable cavities in places. The space in between the fibrils (cable strands) and the scale layer (cuticle) is filled with "matrix" (filler substance). This filler substance consists of proteins, not in the form of helical spirals in this case, but in the form of amorphous (shapeless) substance (Herrmann and Aebi, 2004)

Types of medulla can vary from one species to another. Recently, revealed Incidence of medullation can affect on the hair shaft diameter (Hutchinson and Thompson, 1999). Thus the incidence of medullation could be considered as one of tool to determining the proximity and for identification purpose among different species.

To best of the knowledge the present study is the first attempt to investigate the inter-species relationship of Presbytis Monkey based on hair medulla structure from India.

MATERIALS AND METHODS

Materials for the present study consist of hair strands from 6 species of adult males of the genus Presbytis (e.g. *Presbytis entellus entellus*, *Presbytis cristatus cristatus*, *Presbytis rubicundus*, *Presbytis johnii*, *Presbytis senex nestor* and *Presbytis phayrei phayrei*). Altogether 750 hair strands has been undertaken for the analysis. Hair strands were washed and cleaned following the standard technique (Sen and Das Chaudhuri, 2001) and subsequently, were dried at room temperature for the examination of the medulla structures. For microscopic study on medullation each washed hair strand was mounted on microscopic glass slides with 10 x ocular microscope (Binoculour: Letiz, WETZLAR, Germany) with 0.65 objective resolutions. To study the patterns of medullation a threefold classification of medulla (Banerjee, 1965), i.e., Absent, Continuous and Discontinuous was followed. **Absent** –In this case medulla was absent throughout the shaft (Figure 1). **Continuous** –In this incidence medulla was continuously present from the root to the tip without any breakage (Figure 2). **Discontinuous** –In this case there are breakage in the medullary column (Figure 3). Inferential statistics for categorical variables has been done (Chi² test) and cut off has been set on p=0.05.

RESULT AND DISCUSSION

Distribution of incidences of medullation has been presented in Table 1. It would be apparent from the table that the *Presbytis entellus entellus*, *Presbytis cristatus cristatus* revealed only absent types of medullation. On the other hand, *Presbytis senex nestor*, *Presbytis rubicundus* demonstrated only discontinuous types of medullation. However, *Presbytis johnii*, and *Presbytis phayrei phayrei* demonstrated both discontinuous and absent form of medullation, but totally devoid of continuous form of medullation. Examination on medullary pattern revealed significantly (p<0.05) higher discontinuous medullation among *Presbytis phayrei phayrei* in comparison to *Presbytis johnii*. Medullary study in the present attempt demonstrated the presence of medulla in all species of Presbytis monkeys in different forms, except *Presbytis entellus entellus*, *Presbytis cristatus cristatus*. The result of the present study, however, was almost found to be similar with the earlier study (Roy Tapadar *et al.*, 2010) on Indian Cercopithecus monkeys

The value of hair as a physical evidence is well appreciated in crime investigation. Further, hair by virtue of its chemical composition resists degradation by environmental factors and enzymatic activities to fairly good extent. The morphology and keratin (protein) of hair can be used for species identification. Microscopic hair characteristics of hair have been used for species characterization by Hausman (1920), Teerink. (1991). However, the present study revealed the hairs of the Presbytis monkeys could be divided in two broad type: medullated hair (discontinuous type)

and non-medullated (absent type), which is in corroboration with earlier studies on monkeys (Inagaki, 1986). Medulla of the hair includes sulfur-poor atypical keratin with disordered structure and is composed of thin filaments embedded in amorphous matrix (Chapman, 1986); its structure considerably varies and can be used for taxon identification (Sokolov *et al.*, 1988) even at the level of species (Chakraborty *et al.*, 1999). The medullary pattern generally could be taken as closeness of the species (Clement *et al.*, 1981). Therefore, the medullation pattern noticed in the present study might be additional important criteria for hair study regarding the assessment of phylogenetic status of species and corroborated with earlier study (Inagaki and Yamashita, 1994).

Table 1. Distribution of different form of medullation in non-human primates

Genus Species	N	Continuous	Discontinuous	Absent
Prebytis <i>entellus entellus</i>	125	-	-	125 (100.00)
Presbytis <i>cristatus cristatus</i>	125	-	-	125 (100.00)
Presbytis <i>senex nestor</i>	125	-	125 (100.00)	-
Presbytis <i>rubicundus</i>	125	-	125 (100.00)	-
Presbytis <i>johnii</i>	125	-	95 (76.00)	30 (24.00)
Presbytis <i>phayrei phayrei</i>	125	-	110 (88.00)	15 (12.00)



Figure -1



Figure -2



Figure -3

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