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HAEMOGLOBIN POLYMORPHISM IN COMMENSAL SPECIES OF RODENTS IN INDIA

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ABSTRACT

The present communication reports polymorphism of haemoglobins in six species of rodents belonging to the subfamily Murinae. A composite pattern of four major bands of rodent haemoglobins was observed. Of these, three slow migrating bands are common in all the species. The fast-migrating fourth band was seen only in *Rattus rattus rufescens* (Gray). The same species of rat from Bombay and Pune region show two distinct zones of mobilities, with *R. r. rufescens* from Pune having intermediate mobility.

INTRODUCTION

Taxonomic studies on protein polymorphism in American and European rodents were initiated earlier by modern workers (Selander *et al* 1969, Yosida *et al*, 1971, Johnson, 1974, De Smet, 1978). De Smet (1978) has reported about 40% of polymorphism in various rodent proteins. The results were interesting from a chaemotaxonomic point of view.

Among the various proteins, haemoglobin (Hb) patterns of Indian commensal rodent species were studied earlier (Deoras and Pradhan, 1976 ; Pradhan, 1982). Allelic heterozygosity was seen in the haemoglobins of *B. bengalensis kok* populations from the Bombay and Pune regions of India (Pradhan, 1982). While continuing work on this subject, some additional species belonging to the same subfamily, Murinae, were taken into consideration for comparative purpose. Some interesting results were obtained and they have been reported here in the present article.

MATERIALS AND METHODS

About fifty adult rodent specimens were collected at various localities in Bombay and

TABLE 1

Table showing the sample size for each of the six rodent species collected from Bombay-Pune region.

Sl. No.	Species	Localities	No. of specimens collected
1.	*Rattus rattus rufescens* (Gray)	Pune	5
2.	*Rattus rattus rufescens* (Gray)	Bombay	13*
3.	*Rattus rattus wroughtoni* (Hinton)	Bombay	1
4.	*Rattus norvegicus* (Berkenhout)	Bombay	5
5.	*Bandicota bengalensis kok* (*lordi*) (Gray)	Bombay	17
6.	—do—	Pune	2
7.	*Bandicota indica indica* (*malabarica*) (Bechstein)	Bombay	6**
8.	*Mus* species.	Bombay	1
	Total :		50

* including two specimens with white patch on the thorasic region.

**including two with white tail tip.

Pune for the present studies. The details are given separately. The taxonomic identification was carried out with the help of Ellerman's (1960) key by one of the authors (Pradhan) at the Zoological Survey of India, Western Regional Station's Laboratory, Pune. Blood was collected in a heparinised tube directly from the heart, with a syringe. Haemoglobin was separated from the R. B. C. by the method of Wright (1974). The haemoglobin samples were run on vertical as well as horizontal paper electrophoresis, with Barbitone buffer (Make : Centron, Bombay), at pH 8.6 and molarity 0.05 μ. 5 mA current per strip was passed for nine hours. The strips were then dried in the oven and RF values for each sample were calculated immediately by the following formula :

$$RF = \frac{\text{Distance travelled by Haemoglobin}}{\text{Distance travelled by Marker (Bromophenol Blue)}}$$

Mean RF values and the S. D. of the mean for each species were calculated separately. The values were plotted on the graph and compared.

Observations and Discussions

Fig. 1 is a diagramatic representation of RF values of rodent haemoglobin samples. There are differences in the mobility of haemoglobin in almost all samples. In some cases (e. g., *R. norvegicus* from Bombay and *R. rufescens* from Pune) there was no variation. However, there are number of haemoglobin variants in *Rattus r. rufescens* and *Bandicota bengalensis*. Though Hb variants have already been reported earlier (Pradhan, 1982) in the case of *B. bengalensis* populations, this is the first time to locate Hb variants in *Rattus r. rufescens*. There is a distinct zone of separation between the two groups of variants of *R. r. rufescens*. When the average RF values alongwith S. D. are compared (Fig. 2), the differences become more clear. *R. r. rufescens* and *B. b. kok (lordi)* definitely show the occurrence of intra-sub-specific polymorphism in the haemoglobin

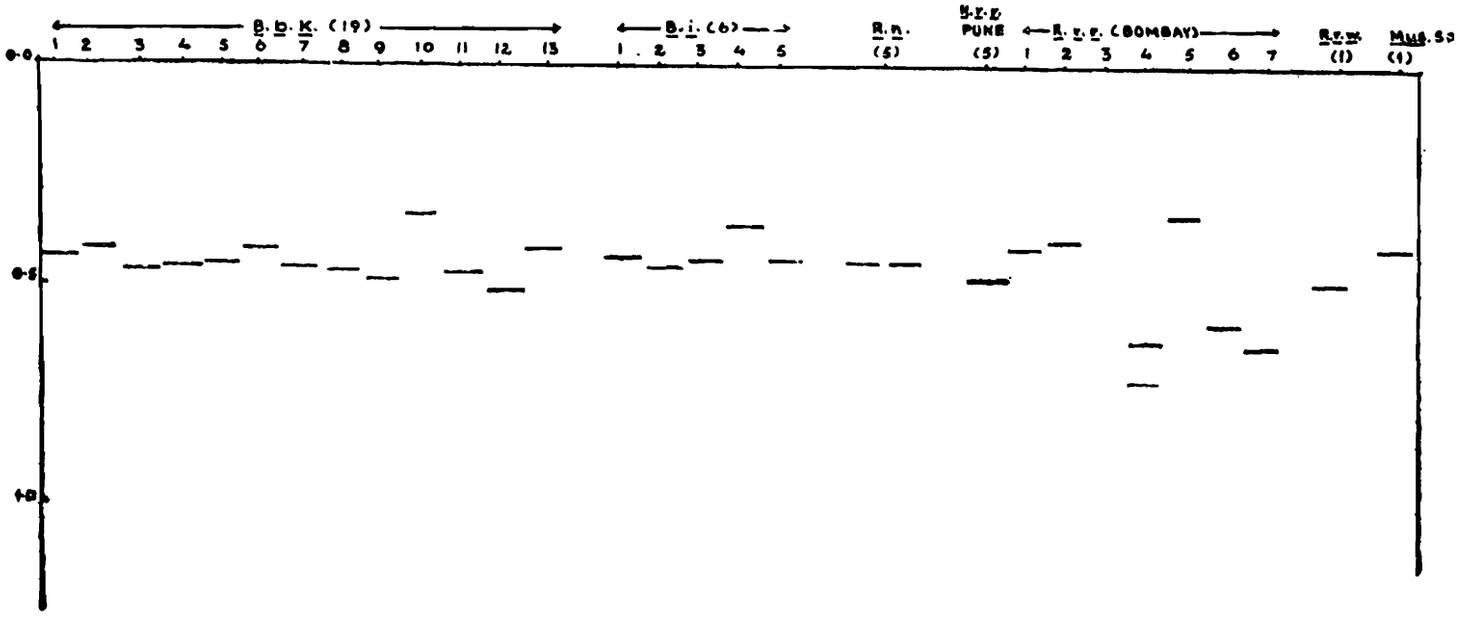

Fig. 1. Different haemoglobin patterns expressed in the terms of RF values for different species. Figures in paranthesis show the sample size.

proteins, while all the other species show one band pattern with differential mobilities. One band pattern in some of these species has already been reported earlier (Pradhan, 1982). When a composite picture for all the six species of the subfamily, Murinae, is carefully studied, it will be seen that all bands have been represented. Present observations on paper electrophoresis show that there are in all four major Hb variants in the natural populations of the six commensal rodent species belonging to the subfamily, Murinae. *Bandicota bengalensis* is the only species which represents all the three slow migrating bands. The fastest migrating band seems to be rare and is represented, at present, only in *Rattus rattus* subspecies.

The haemoglobin pattern does not seem to have any significant correlation with the colour phases seen in some of these species (*R. rattus rufescens* and *B. indica*). The Hb patterns of *R. rattus rufescens* with diamond shaped white patch on the thorasic region and *B. indica* with white tail tip seem to be similar when they are compared with those of their normal counterparts. Pradhan and Mithel (1981) have reported variation in the karyomorphology of *R. r. rufescens* with diamond shaped white patch on the thorasic region. However, it is apparently seen here that the Hb protein pattern of these peculiar specimens do not show variation in their mobilities from those of normal specimens. Like De Smet (1978) we believe that the existence of intra-subspecific haemoglobin polymorphism is a common phenomenon in the subfamily Murinae. It is quite possible that if attempts are made in future to study

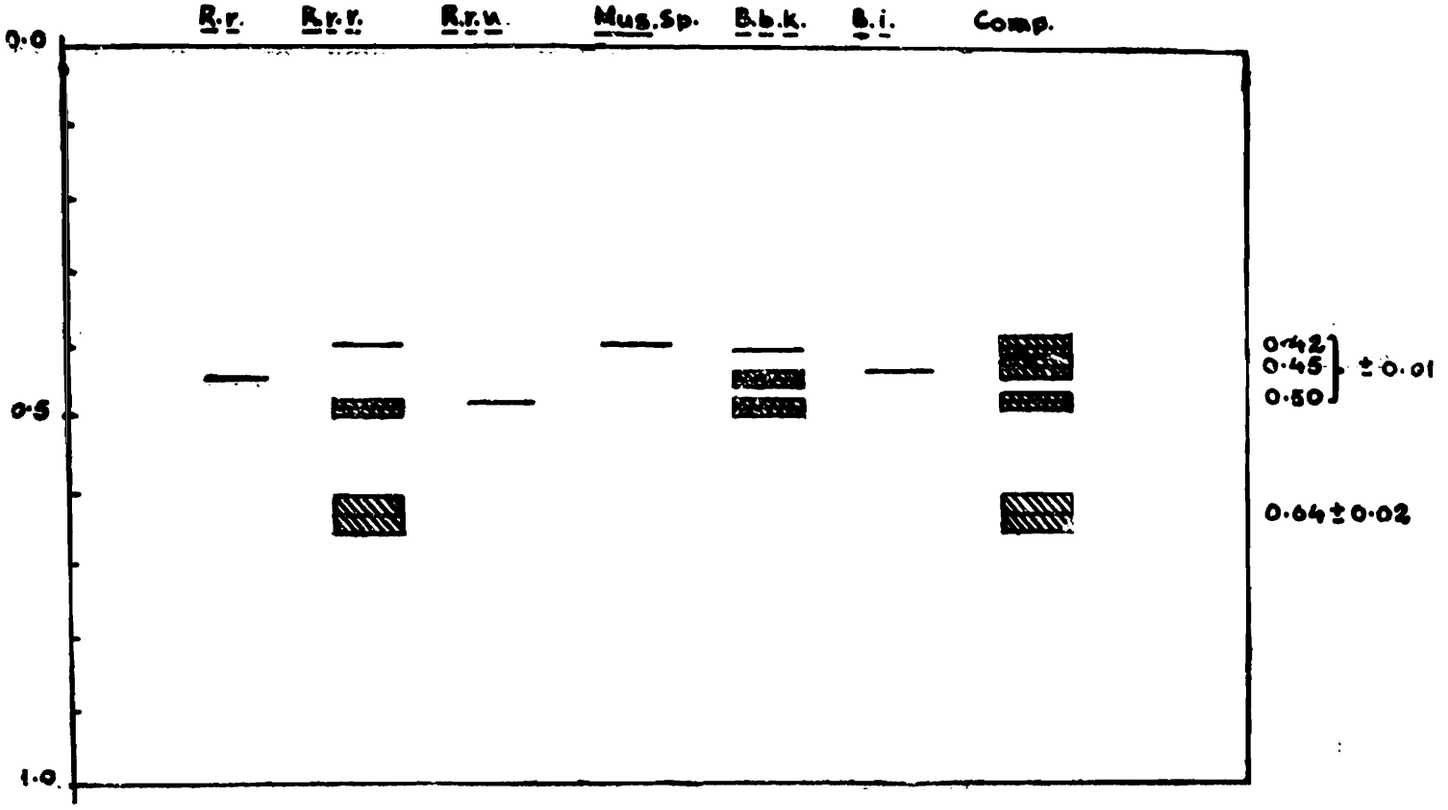

Fig. 2. Commonly occuring haemoglobin bands expressed in the terms of mean RF values with standard deviations (shaded in lines) in each of the six species. It also shows composite haemoglobin pattern for all the six commensal rodent species.

the haemoglobin patterns alone in all the Indian rodent species, the number of Hb variants moving freely in the natural populations will also increase. But, in that case, it will become easier to draw a definite line of phylogeny at a protein level. At present, attempts are already in progress to study the variations occuring even in the minor fractions of Hb patterns in these species.

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ABBREVIATIONS

R. r. r.	:	*Rattus rattus rufescens.*
R. r. w.	:	*Rattus rattus wroughtoni.*
R. n.	:	*Rattus norvegicus.*
Mus. sp.	:	*Mus* species
B. b. k.	:	*Bandicota bengalensis kok.*
B. i.	:	*Bandicota indica.*
Comp.	:	Composite haemoglobin pattern.