

Investigation of Haemoglobin Polymorphism in the Indian Bikaneri Sheep

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Haemoglobin polymorphism in the Indian Bikaneri sheep breed in two age-groups, i.e., 1–6 months and 6 months–1 year was investigated. 18.75% Hb A type, 31.25% Hb B type and 50.0% Hb AB type were found. while 0.44 Hb AA and 0.56 Hb BB gene frequencies were observed.

Key words: Haemoglobin, polymorphism, blood, sheep.

INTRODUCTION

No two human beings are exactly alike in their inborn biochemical traits¹ and this is perhaps also true for the animals as well. In nature, the genetic variations are brought about by mutation of genes. As the process of evolution in the animal kingdom proceeds, a number of genes have been mutated, many have been eliminated by selection and many are occurring in what is termed as a balanced polymorphism. Polymorphism is the occurrence together of two or more varieties in the same population at the same time in such proportions that even the rarest of them cannot be maintained by mutation alone.²

Extensive work^{3–8} has been done in the past few years for studying the physiological status of female farm animals, with special reference to sheep.

Production in animals is the result of a series of biochemical reactions utilizing different metabolites in the body. In order to maintain the animal body in a physiologically proper state to get optimum production, different metabolites should be made available to the animal. Carbohydrates, proteins and lipids are the main required complexes in feeds. which maintain the animal body and regulate probable production. Besides these, a number of other organic and inorganic substances such as vitamins, minerals, trace elements are also essential at one stage or the other to consummate the process of metabolism for the animal's own existence as well as production.

Three distinct haemoglobin types in sheep were reported by Harris and Warren⁹, Cabannes and Serain¹⁰, Rodnan and Ebaugh¹¹. Giri and Pillai¹² found only one type of haemoglobin in the blood of sheep. Fine *et al.*¹³ also did not find haemoglobin polymorphism in sheep.

In view of the above it could be interesting to investigate the haemoglobin polymorphism in Indian sheep. Sheep is an animal of India's national importance. as its utility is evidenced by way of getting wool, milk, skin and meat from it. Although India occupies a prominent position among sheep rearing countries, sheep production in the country still lags far behind. In order to improve the sheep

production, it is a must to explore all the productive potentialities. An attempt has therefore been made in the present study to initiate the understanding of the different metabolic processes involved in sheep, selecting the Indian Bikaneri sheep.

EXPERIMENTAL

The animals: The Bikaneri lambs and the Bikaneri adult sheep were maintained at the Department of Physiology, U.P. College of Veterinary Science and Animal Husbandry, Mathura. The animals in the following two age-groups were selected at random from the flock:

- (i) 1-6 months,
- (ii) 6 months-1 year.

All the animals maintained under usual farm conditions were healthy.

Collection of the blood samples: The blood samples taken directly from the jugular veins of the animals were collected in sterile 15 mL centrifuge tubes containing 1 mg EDTA for each mL of blood. The samples were centrifuged immediately at 3000 r.p.m. for 30 min. The plasma was removed by pasteur pipette and the red blood cells were then washed with normal saline and were centrifuged again. The supernatant was discarded. The whole process was repeated four times to remove the entire plasma entrapped between the RBCs. Equal volumes of doubly distilled water were then added to each sample to hemolyse the cells.

Hemolysates were prepared by adding 2 volumes of doubly distilled water to the blood for routine screening and the results of paper electrophoresis of such hemolysates were found to be comparable to the paper electrophoresis of hemolysates prepared by the above method.

Paper electrophoresis: A Carl Zeiss Jena paper electrophoresis apparatus was used. Strips of Whatman filter No. 1, 30 cm × 4 cm were cut. A pencil line was drawn width-wise at a distance of 10 cm from one end. Eight strips were saturated with buffer, blotted and adjusted over the bridge kept in the electrophoresis cabinet. Trays of the electrophoresis cabinet were filled with buffer. A current at 200 V was allowed to flow through the buffer in order to equilibrate the buffer on the paper strips. 0.01 mL of hemolysate was spread on the line drawn at 10 cm with the help of a micropipette in the form of a streak over the width of the strip. Electrophoresis was run at 200 V for 16 h.

The buffers used for electrophoresis: Tris-borate buffer¹⁴ solutions of pH 9.2, which were prepared by dissolving 60.5 g of tris-(hydroxymethyl) amino methane, and 4.6 g of boric acid in 1000 mL of distilled water were used for electrophoresis.

Following the classification of Evans *et al.*¹⁵ the haemoglobin that migrated more rapidly to the anode on electrophoresis was designated as haemoglobin-A (Hb-A), while the less rapidly migrating type was termed as haemoglobin-B (Hb-B). The haemoglobin, which presented 2 bands on electrophoresis, was designated as Hb AB.

RESULTS AND DISCUSSION

The sheep population on which the study was undertaken was found to be having three different haemoglobin types: (i) Hb-A type, (ii) Hb-B type and (iii) Hb-AB type. The results have been reported in Tables 1 and 2.

TABLE-1
Hb POLYMORPHISM IN INDIAN BIKANERI SHEEP
(per cent distribution)

S.No.	No. of animals	Animal's haemoglobin type	Per cent distribution of the haemoglobin type
1.	06	Hb A	18.75
2.	10	Hb B	31.25
3.	16	Hb AB	50.00
Total	32		100.00

TABLE 2
Hb POLYMORPHISM IN INDIAN BIKANERI SHEEP
(The gene frequencies)

S. No.	Animal's haemoglobin type	Gene frequency
1.	Hb-A	0.44
2.	Hb-B	0.56

The per cent distribution of the haemoglobin types obtained in the present study was almost of the pattern reported by Wislinski and Studizinski¹⁶ on their study on the sheep of the Polish breed.

The gene frequencies found in the present study were in accord with the gene frequencies reported by Ghosh *et al.*¹¹ in their study on some indigenous sheep breeds of Rajasthan (India).

Evans¹² *et al.* reported that type Hb-A was predominant in mountain and hill breeds and type Hb-B was predominant in the lowland sheep breeds, which also supports the results obtained in the present study. Further studies are in progress.

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