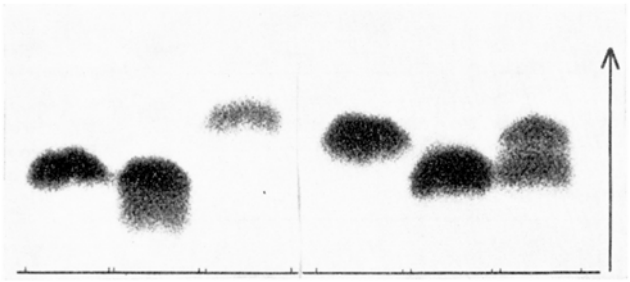
Studies on Haemoglobin Variants and Glucose-6-Phosphate Dehydrogenase in Indian Sheep and Goats

Recently we undertook an investigation on the distribution of haemoglobin variants and the enzyme glucose-6-phosphate dehydrogenase (G6PD) in Indian sheep and goats. Animals of one to three years of age were selected for this study. Paper electrophoresis for the separation of haemoglobin variants was carried out by the method of SMITH and CONLEY[1]. Glucose-6-phosphate dehydrogenase was determined by the screening technique of MOTULSKY and CAMPBELL[2] as well as by the quantitative technique of MARKS[3]. The Figure shows the haemoglobin patterns in sheep and goat. The analysis of the genotype distribution of haemoglobin variants is detailed in the Table.



Distribution of two haemoglobin variants in Indian sheep and goats

Species	No. tested	Haemoglobin			Gene frequency	
		AA	AB	BB	Hb-A	Hb-B
Sheep	100	4	19	77	0.135	0.865
Goat	100	85	15	Nil	0.925	0.075

As shown by earlier workers[4–6], Indian sheep and goats also possess two haemoglobin variants. The frequency of gene Hb-A (0.135) in sheep is lower than gene Hb-B (0.865). These frequencies are comparable with those of Leicester breed[4] and Dutch stock[5]. EVANS et al.[4] have also reported a higher frequency of Hb-A (61%) in Scottish Blackface sheep. The preponderance of Hb-A and its greater affinity to oxygen have been shown to be characteristic of sheep stock of higher altitudes[6]. Present findings of lower frequency of Hb-A in low altitude Indian sheep stock are in agreement with these observations. Indian goats have a lower frequency of Hb-B. No homozygous BB was detected in one hundred samples which were investigated. Foetal haemoglobin of goats has a faster mobility than the two adult variants.

Blood samples from sixty sheep and forty goats investigated for G6PD showed complete absence of this enzyme, which was otherwise present in other species like buffalo, cattle, dog, horse and rabbit (unpublished observation). The absence of G6PD in sheep and goats has great importance in view of the key role this enzyme plays in carbohydrate metabolism. Whether the alternate pathways involving higher transketolase (TK) and transaldolase (TA) activities demonstrated by BONSIGNORE et al.[7] in the G6PD deficient people exists in the erythrocytes of Indian sheep and goats, would be worth investigating. The studies on the deficiency of G6PD in sheep and goats and its possible relationship to greater resistance to trypanosome infection[8] would be significant in light of the reported resistance of the G6PD deficient human beings to malarial parasites[9,10].

Résumé. Deux variantes d'hémoglobine Hb-A et Hb-B ont été démontrées chez le bouc et le mouton Indiens. Les fréquences génétiques pour Hb-A et Hb-B sont respectivement 0.135 et 0.865.

Le fervent déhydrogénase de glucose-6-phosphate chez les érythrocytes de bouc et de mouton est absent. Nous avons employé la méthode semi-quantitative de MOTULSKY pour la détermination de l'activité de déhydrogénase de glucose-6-phosphate.

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Über das Glukuronsäurekonjugat eines Cardenolidgenins (3-Epi-digitoxigenin)

In vorangegangenen Arbeiten über die Biotransformation von Digitoxin und Digitoxigenin bei der Ratte ist berichtet worden, dass das intermediär gebildete 3-Epi-digitoxigenin mit Glukuronsäure konjugiert wird[1,2]. Das 3-Epi-digitoxigenin-glukuronid wurde damals[2] irrtümlich als eine chloroformlösliche Verbindung mit einem $R_{\text{Digitoxigenin}}$-Wert von 0,26 (Papierchromatographie im

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