

Serum protein and red cell enzyme polymorphisms in Oraon tribe, India

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Summary. Blood specimens from 134 Oraon, a Dravidian-speaking tribe in Bihar, India, have been tested for haptoglobin, transferrin, ceruloplasmin, phosphoglucomutase, lactate dehydrogenase, albumin, and malate dehydrogenase types by starch gel electrophoresis. Low Hp¹ and high Tf² gene frequencies emerge.

The Oraons are one of the largest tribes in India, mostly settled in the Ranchi district, Southern Bihar. According to the 1961 census of India, the Oraon population was 564 744. They speak a dialect known as Kurukh, of Dravidian origin, and according to tradition entered Chotanagpur from the west, divided into 26 major totemic clans and 44 sub-clans. Many Oraons are Christian converts, and hold an economical and educational advantage over others who retain the semi-Hindu tribal traditions. They are settled agriculturists (Roy, 1915). Blood specimens were collected by finger-prick from 134 persons living in villages near Banari police station, Ranchi district. Near blood relatives were, as far as possible, excluded. The blood specimens were kept in iced thermos flasks until they reached the laboratory at Calcutta, where the specimens were separated, and the haemolysates and sera frozen at -20°C until tested.

Starch gel electrophoresis, using hydrolysed Connaught starch, for haptoglobin, transferrin, ceruloplasmin and albumin, used the buffer system of Ashton and Braden (1961) at pH 8.2. One half of the sliced gel was stained with amido black for identification of transferrin and albumin variants, the other half were treated with α -dianisidine following the methods of McCombs, Bowman and Alperin (1970), and incubated at 37°C to develop the ceruloplasmin pattern. A mixture of hydrogen peroxide, benzidine and glacial acetic acid was then added to this gel, to visualize the haptoglobin type. The buffer systems, reaction mixture and other conditions of the electrophoresis were as described in Waltar, Neumann, Yannissis and Stegmüller (1967) for phosphoglucomutase, and in Blake, Kirk, Pryke and Sinnet (1969) for lactate dehydrogenase and malate dehydrogenase.

The phenotype and gene frequencies of haptoglobin, transferrin, ceruloplasmin, phosphoglucomutase and lactate dehydrogenase are shown in the table. No variant phenotype of albumin or malate dehydrogenase was detected.

The results indicate that this sample is extreme in several ways. First, there is complete absence of the Hp¹-1 phenotype, giving a very low frequency of the Hp¹ gene. These results are similar to the haptoglobin frequencies observed by Kirk,

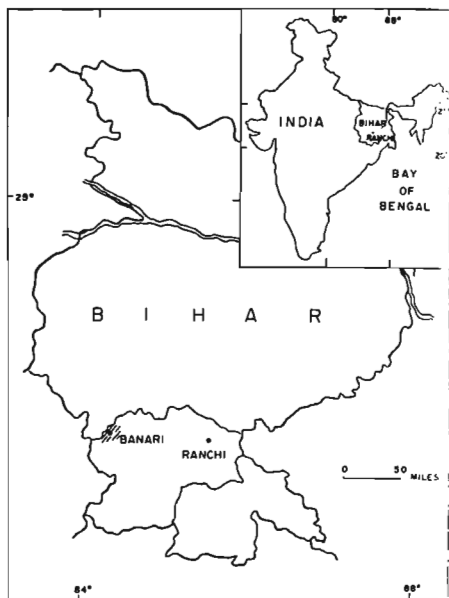


Figure. Map of Bihar, hatched area showing the distribution of Oraons under survey in Ranchi district. Inset: Map of India with reference to Bihar.

Lai, Vos and Vidyarthi (1962) among the Oraon, barely significant in the difference of the phenotype frequencies in the two samples. Similarly, the transferrin results confirm the high frequency among the Oraons of the CD variant, and the present frequency (9.3 per cent) is the highest ever recorded in an Indian sample, as comparison with the summary table of Papiha and Wastell (1974) shows. Ceruloplasmin variants are rare in Indian populations, for Mukherjee, Das and Kellerman (1974) observed one AB variant in Mahishyas, and one BC variant in West Bengal Muslims, but otherwise only the Cp^a gene appears in Indian samples so far studied.

For phosphoglucomutase at locus 1, the PGM_1^1 gene frequency falls well within the Indian range (0.63 amongst Rajput to 0.79 amongst Vaish (Blake, Kirk, McDermid, Keichi Omoto and Ahuja, 1971) and no uncommon variant occurred. For lactate dehydrogenase, the faster A sub-unit variant (LDH Cal-1, Das *et al.*, 1970) is present in many Indian populations at low frequency, and in the present sample the frequency of 2.2 per cent is comparable with that of the neighbouring Munda tribe (Mukherjee, Das and Dash Sharma, 1973). The absence of variant forms of albumin and malate dehydrogenase in the sample is not surprising, since

	Number rared	Phenotypes				Gene frequency		χ^2 d.f.	P
		1-1	2-1	2-2	Hp(O) 2	Hp ¹ 0.081	Hp ² 0.919		
Haptoglobin	Obs. No.	0	20	104	2				
	%	0.00	15.87	82.54	1.59				
	Exp. No.	0.81	18.5	104.7					
Transferrin	Obs. No.	CC	CD	DD		Tf ^c	Tf ^b		
	%	1.14	12	0		0.952	0.048	0.31	>0.50
	Exp. No.	90.47	9.53	0.00					
Cerdopileamin	Obs. No.	BB	AB	B-NH		Cp ^a	Cp ^a		
	%	114.2	11.5	0.3		0.992	0.004		
	Exp. No.	124	1	1					
Phosphoglucomutase (PGM1)	Obs. No.	98-42	0.79	1	0.79				
	%	128.0	1.0	1.0					
	Exp. No.	1-1	2-1	2-2		FGM ¹	FGM ¹		
Lactate dehydrogenase	Obs. No.	42	46	7	7	0.684	0.316	1.38	>0.20
	%	44.21	48.42	7.37					
	Exp. No.	44.5	41.1	9.5		LDH ^M	LDH ^{CUU}		
Lactate dehydrogenase	Obs. No.	Normal	Cal-1 (Hetero)	Cal-1 (Homo)		0.989	0.011	0.60	>0.30
	%	131	3	0					
	Exp. No.	97.76	2.24	0.00					
		131.1	2.9	0.02					

Table. Distribution of serum protein, serum and red cell enzyme phenotypes, and gene frequencies, in Orson of Ranchi.

only three cases of the slow-migrating type of albumin variant and a solitary malate dehydrogenase variant have been reported respectively (McDermid, 1971; Das, Malhotra, Mukherjee and Das, 1974). The present sample is, of course, very local in its derivation, and the Oraon marriages usually take place within a radius of about 16-20 km, so the slight difference in frequency of haptoglobin and transferrin types from those in the earlier sample of Kirk *et al.* (1962) are not surprising, and, indeed, both samples are similar in the extreme frequencies they demonstrate in these systems.

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Zusammenfassung. Blutproben von 134 Oraon, ein Dravidianisch sprechender Stamm aus Bihar, Indien, wurden auf Haptoglobin, Transferrin, Ceruloplasmin, Phosphoglucomutase, lactate Dehydrogenase, Albumin und malate Dehydrogenase Typen durch starke gel electrophoresis geprüft. Niedrige Hp¹ and he T¹⁰ Gene-Häufigkeiten tauchen auf.

Résumé. L'analyse des haptoglobines, transferrines, ceruloplasmines, phosphoglucomutases, lactate déhydrogénases, albumine déhydrogénases et malate déhydrogénases par électrophorèse de gel d'amidon a été faite sur du sang prélevé chez 134 Oraons, tribu de dialecte dravidien, à Bihar (Inde). De faibles fréquences de gènes Hp¹ et des fréquences élevées de gènes T¹⁰ ont été trouvées.