

HUMAN PLACENTAL PHOSPHOGLUCOMUTASE LOCUS 3 STUDIES IN THE ITALIAN POPULATION

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Summary Phosphoglucumutase locus 3 (PGM₃) phenotypes have been examined in placental samples from a total of 532 Italian subjects. The PGM₃ similarity in some different ethnic groups excludes this polymorphism from the useful anthropological markers.

INTRODUCTION

Phosphoglucumutase is a phosphotransferase [EC 2.7.5.1] which catalyses the reversible transformation of glucose-1-phosphate to glucose-6-phosphate. Different molecular forms of human phosphoglucumutase exist which are controlled by three different structural loci, PGM₁, PGM₂ and PGM₃, each with several alleles. Only PGM₁ and PGM₃ have been found polymorphic in all the populations so far examined (Spencer *et al.*, 1964; Hopkinson and Harris, 1964; Hopkinson and Harris, 1968; Ishimoto, 1969; Lamm, 1970; Herzog and Drdova, 1971; Monn and Gjønnaess, 1971; Van Wierst *et al.*, 1973; Blake and Omoto, 1975; Donald, 1977).

PGM₃ population studies have been fairly limited. This is due both to the necessity of requiring material other than red cells to determine PGM₃ phenotypes and to the electrophoretic changes caused by the progressive generation of more anodal "secondary" isozymes at the expense of the "primary" enzyme form (Fisher and Harris, 1972).

This report concerns samples obtained from six different Italian districts and examined for this genetic marker.

MATERIALS AND METHODS

Placentae were consecutively collected in the regional hospitals of Rome, l'Aquila, Pavia, Cagliari, Sassari and Nuoro. The samples were immediately frozen at -20°C . The tissue aqueous extracts were generally made within 15 days from delivery and examined within 24 hr according to Harris and Hopkinson (1976) (Fig. 1).

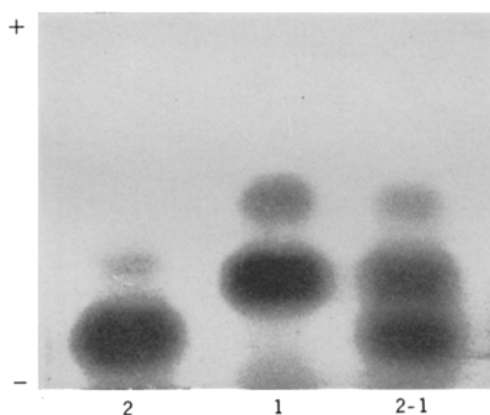


Fig. 1. PGM_3 common electrophoretic phenotypes.

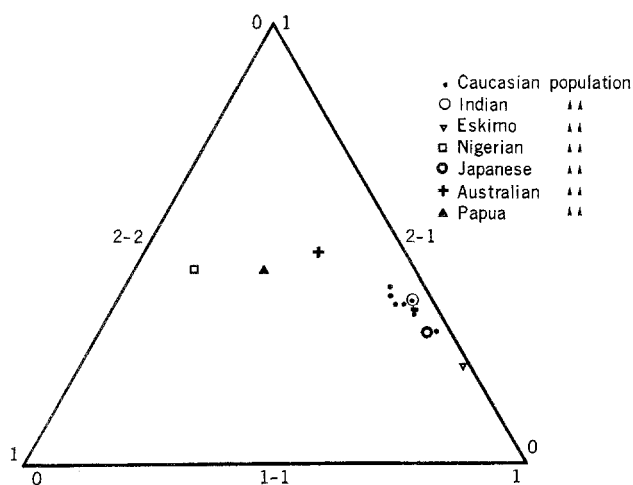


Fig. 2. Graphic representation of the world distribution of the PGM_3 genotypic frequencies.

Table 1. Phenotypes and gene frequencies in six Italian districts.

Population		Phenotypes			Total	Alleles	
		1	2-1	2		PGM ₃ ¹	PGM ₃ ²
Roma	n°	49	29	0	78	0.81	0.19
	%	0.63	0.37	0.00			
L'Aquila	n°	59	39	7	105	0.75	0.25
	%	0.56	0.37	0.07			
Pavia	n°	79	38	6	123	0.80	0.20
	%	0.64	0.31	0.05			
Sassari	n°	24	10	4	38	0.76	0.24
	%	0.63	0.26	0.11			
Cagliari	n°	62	30	6	98	0.79	0.81
	%	0.63	0.31	0.06			
Nuoro	n°	70	40	7	117	0.77	0.23
	%	0.60	0.34	0.06			
Italy	n°	343	186	30	559	0.78	0.22
	%	0.61	0.33	0.05			
	χ^2 id.f.	0.02	0.17	0.33			

* Calculated to test the Hardy-Weinberg equilibrium.

Table 2. PGM₃ gene frequencies in all the populations examined up to now.

Population	N° of subjects	Gene frequencies		References
		PGM ₃ ¹	PGM ₃ ²	
Norwegian (Norway)	660	0.73	0.27	Monn and Gjønaess (1971)
Danish (Denmark)	1,031	0.75	0.25	Lamm (1970)
English (England)	583	0.74	0.26	Hopkinson and Harris (1968)
German (North Germany)	74	0.82	0.18	Ritter (1976)
German (South-Western Germany)	289	0.77	0.23	Bissbort <i>et al.</i> (1975)
Italian (Italy)	532	0.78	0.22	present investigation
Czechoslovak (Czechoslovakia)	146	0.76	0.24	Herzog and Drdova (1971)
SWO-Caucasian (Canada)	1,382	0.77	0.23	Donald (1977)
SWO-Random (Canada)	1,468	0.76	0.24	Donald (1977)
Indian (Canada)	230	0.77	0.23	Donald (1977)
Eskimo (Canada)	82	0.88	0.12	Donald (1977)
Nigerian (England)	235	0.34	0.66	Hopkinson and Harris (1968)
Japanese (Japan)	370	0.81	0.19	Ishimoto (1969)
White Australian (Canberra)	205	0.78	0.22	Van Wierst <i>et al.</i> (1973)
Aborigine Australian (Australia)	101	0.59	0.41	Van Wierst <i>et al.</i> (1973)
Papua New Guinean (Papua)	191	0.51	0.48	Van Wierst <i>et al.</i> (1973)

RESULTS AND DISCUSSION

The distribution of the PGM₃ phenotypes observed in the six Italian samples and the corresponding gene frequencies are shown in Table 1.

Analysis of the results showed similar PGM₃ gene frequencies in all six groups (Homogeneity: $\chi^2=2.59$, d.f. 5, P n.s.). They were therefore combined and comprise the Italian population. Investigations carried out up to now (Table 2) show some ethnic differences but the position of some populations in terms of PGM₃ gene frequencies seems to exclude this system from the useful anthropological markers (Fig. 2).

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