SHORT PAPER

Genetic variants of liver and pancreas mannosephosphate isomerase in the Guinea fowl¹⁾

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ABSTRACT

Liver and pancreas mannosephosphate isomerase of the guinea fowl was examined electrophoretically. Three electrophoretic patterns, designated as A, AB and B, were observed in a closed population of the species (Galor strain). Mating experiments indicated that these phenotypes are controlled by autosomal codominant genes, which are symbolized as *MPI-I^A* and *MPI-I^B*. Of a total of 161 individuals examined, 59, 82 and 20 were classified as A, AB and B, respectively.

Electrophoretic variants of mannosephosphate isomerase have been reported in mice (Nichols *et al.* 1973), cattle (Ansary and Hanset 1973), quail and chicken (Kimura *et al.* 1980, 1981). In the guinea fowl (*Numida meleagris*), genetic variants have been observed in serum albumin and serum amylase (Shiraishi *et al.* 1978), but no study was so far made of mannosephosphate isomerase.

The present note describes electrophoretic variation in liver and pancreas mannosephosphate isomerase of the species.

A closed stock of the guinea fowl (Galor strain) maintained by random breeding were used at various ages after hatching. The liver and pancreas were homogenized in an equal volume of distilled water with a glass homogenizer. The homogenates were centrifuged at $18,000\times g$ for 30 min at 4°C and the supernatants were used for electrophoresis. The electrolyte buffer solution (pH 7.0) was prepared by dissolving 16.35 g of tris (hydroxymethyl) aminomethane and 9.04 g of citric acid in one liter of distilled water. The gel (220 by 160 by 6 mm) was prepared using 300 ml gel buffer (electrolyte buffer 20 ml + distilled water 280 ml) and 33 g Connaught hydrolysed starch depending on the marker in question. Electrophoresis was carried out with a constant current of 1.25 mA/cm gel width for 390 min at 4°C. After the electrophoresis, gel plates were stained by the method of Nichols *et al.* (1973) for mannosephosphate isomerase.

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Fig. 1. Electrophoretic patterns of liver and pancreas mannosephosphate isomerase in the Guinea fowl.

Two bands, one slow migrating and the other fast migraty, were identified as mannosephosphate isomerase in both the liver and pancreas. Each of these two bands was of the same mobility in both organs.

Three mannosephosphate isomerase phenotypes were found and designated as MPI-I A, MPI-I AB and MPI-I B (Fig. 1.).

Inheritance of each MPI-I type in various matings is summerized in Table 1.

Table 1. *Distribution of mannosephosphate isomerase isozyme in progenies from various matings. Figures in parentheses are expected values*

Mating	No. of mating	No. of progenies tested	Phenotype			χ^2	P
			A	A B	B		
A $\times$ A	2	8	8 (8)	0	0		
A $\times$ A B	12	49	30 (24.5)	19 (24.5)	0	2.42	<0.25
A $\times$ B	6	21	0	21 (21)	0		
A B $\times$ A B	10	30	10 (7.5)	17 (15)	3 (7.5)	3.80	<0.25
B $\times$ A B	2	8	0	2 (4)	6 (4)	2.00	<0.25
B $\times$ B	1	5	0	0	5 (5)		

Table 2. *MPI-I* phenotype frequencies and gene frequencies in a stock of the guinea fowl

No. of individuals	Distribution of <i>MPI-I</i> phenotype			Gene frequency	
		A	A B	B	<i>MPI-I^A</i> <i>MPI-I^B</i>
161	Observed	59	82	20	0.615 0.385
	Expected	60.86	76.31	23.83	

These results show that the two bands are controlled by two autosomal codominant alleles. Gene symbols, *MPI-I^A* and *MPI-I^B*, are given to the genes controlling the slower and faster migrating bands, respectively.

Frequency distribution of the three phenotypes in a Galor strain of the guinea fowl is shown in Table 2.

Of a total of 161 individuals, 59 were revealed as *MPI-I A*, 82 as *MPI-I AB* and 20 as *MPI-I B*.

These genes will be useful for genetical studies as well as for characterizing stocks of the guinea fowl. Homozygote individuals for the above genes have only one band. It might, therefore, be possible to distinguish each *MPI-I* component in liver and pancrea.

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REFERENCES

- ANSAY, M. and HANSET, M. (1973) Polymorphism of mannose-6-phosphate isomerase in cattle. *Anim. Blood Grps biochem. Genet.* **4**, 169-173.
- KIMURA, M., ISHIGURO, M., ITO, S. and ISOGAI, I. (1980) Protein polymorphism and genetic variation in a population of the Japanese quail. *Japan. Poult. Sci.* **17**, 312-322.
- KIMURA, M., YAMAMOTO, S., ITO, S. and ISOGAI, I. (1981) Mannosephosphate isomerase electrophoretic variants in the chicken. *Japan. Poult. Sci.* **18**, 178-181.
- NICHOLS, E. A., CHAPMAN, V. M. and RUDDLE, F. H. (1973) Polymorphism and linkage for mannosephosphate isomerase in *Mus musculus*. *Biochem. Genet.* **8**, 47-53.
- SHIRAISHI, K., WATANABE, S., SHIBATA, T. and HIRAI, Y. (1978) Genetic polymorphism of serum albumin and serum amylase isozyme in the guinea fowl. *Japan. Poult. Sci.* **15**, 302-307.