Brief Communication

Uridine Monophosphate Kinase Polymorphism in Two Venezuelan Populations

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A polymorphism of uridine monophosphate kinase (UMPK) was described in 1974 by Giblett et al. [1] who found electrophoretic variations in red blood cells from Caucasoid and Oriental populations from the Seattle area. From family studies, they concluded that inheritance is the codominant type based on three alleles (UMPK1, UMPK2, UMPK3). The UMPK locus has been assigned to chromosome 1 [2, 3].

UMPK gene frequency data are currently limited to a few populations [1, 4, 5]. In this report, we present the results of a study of this locus in Venezuelan populations.

MATERIAL AND METHODS

A total of 510 blood samples were studied: 442 from donors to the blood bank of the Hospital de las Fuerzas Armadas, 20 cord bloods from the maternity hospital, Concepción Palacios, of Caracas, and 64 samples from the Warao Indians of Nabasanuka village. The Warao is a primitive population living on the islands of the Orinoco Delta in eastern Venezuela and adjacent zones of Guiana and Surinam.

Blood was anticoagulated in acid-citrate-dextrose, and the red cells were used immediately or were stored frozen in glycerol for later use. Horizontal electrophoresis was performed in a discontinuous histidine-citrate buffer, pH 6.5, according to Fildes and Harris [6] at 4°C and 4.5 V/cm. The gels were stained by covering the sliced surface with filter paper soaked in the staining solution. The staining procedure and the quantitative assay have been described by Giblett et al. [1].

RESULTS AND DISCUSSION

The results obtained from the Venezuelan mestizo population of Caracas and from the Warao Indians of the Orinoco Delta are presented in table 1. All cord bloods were classified as UMPK 1. The phenotypes 1, 2-1, and 3-1 were observed among the mestizo, the last being present only in a mother and her son. The phenotype UMPK 2 was not found among the Warao Indians studied.

The population of Caracas is considered to be a mixture of 55% Caucasoid and 45% Indian and Negro [7], on the basis of studies with other markers, such as the Diego blood factor, Hb S, etc. The finding of three UMPK alleles, therefore, was not unexpected.

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The Warao Indian tribe is one of the larger of the few unacculturated Indian groups that live in South America. It has remained genetically isolated and has been the subject of numerous studies [7, 8]. The Warao Indians are considered to be without Caucasoid or Negroid admixture and probably have very little admixture with their neighbors, the Carib and Arawak.

In the electrophoretic studies, we observed that slow migrating bands corresponding to UMPK 2 disappeared faster than UMPK 1 bands in blood stored at 4°C or repeatedly frozen and thawed. This result agrees with that of Teng et al. [9, 10]. In the Warao Indians, the UMPK 3 band was consistently more prominent than UMPK 1. In thermostability tests carried out with the crude extracts under standardized conditions, we observed that the two enzymes UMPK 1 and UMPK 3 have different rates of thermal denaturation. The activity of UMPK 1 decays more promptly than that of UMPK 3, and its residual activity was consistently lower than that of UMPK 3 during the entire period. These results indicate that UMPK 3 is more stable than UMPK 1.

Quantitation of the enzyme activity in samples that had been frozen for a few months gave values of 0.60 to 1.2 which are within the range reported for the UMPK 1 type.

![Starch gel electrophoretic patterns](image)
URIDINE MONOPHOSPHATE KINASE

[6]. Of seven UMPK 3-1, the four that were tested gave a mean of 1.31 and individual values between 0.52 and 2.33 U/g Hb; the two UMPK 3 bloods gave values of 1.00 and 2.37 U/g Hb.

The Warao Indians appear to have a relatively high frequency of the UMPK$^3$ gene with an unexplained large proportion of 3-3 to 3-1 samples. The two UMPK 3 homozygotes are uncommon. It has also been suggested [2] that individuals with lower levels of UMPK activity might be less likely to develop neoplastic diseases than those whose genotypes produce the higher levels since UMPK catalytic activity is essential for cell proliferation.

The Warao villages have inbreeding rates between 0.001 and 0.003 that have increased in recent generations. The high frequency of the UMPK$^3$ gene among these Indians could be explained by the isolated character of the population, although selection might be operative.

SUMMARY

A study of the uridine monophosphate kinase (UMPK) electrophoretic patterns in Venezuelan individuals from the mestizo population of Caracas and from the Warao Indians of the Nabasanuka village in the Delta of the Orinoco River are reported. Among the mestizo population, the frequency of the UMPK$^1$, UMPK$^2$, and UMPK$^3$ alleles was .979, .020, and .001, respectively. A higher frequency of the UMPK$^3$ gene was seen in the highly inbred Warao Indians than any other population studied to date.

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REFERENCES


The American Cleft Palate Association

The American Cleft Palate Association will hold its 35th annual meeting at the Hilton Inn, Atlanta, April 5–8, 1978. ACPA is a multidisciplinary organization representing all professional specialties involved in research and clinical activities related to cleft lip/cleft palate and other craniofacial anomalies. There are 1,300 members with representation from 25 countries. The Association sponsors an annual meeting and co-sponsors the International Congress on Cleft Palate. The Cleft Palate Journal is published quarterly. For information concerning the annual meeting or membership in ASA contact Mrs. Flora Berk, Executive Secretary, American Cleft Palate Association, 331 Salk Hall, University of Pittsburgh, Pittsburgh, Pennsylvania 15261.

Tenth Stadler Genetics Symposium

The 10th Stadler Genetics Symposium will be held April 7–8, 1978 at the University of Missouri, Columbia, Missouri. The speakers will include Arthur Chovnick, University of Connecticut; Robert DeMars, University of Wisconsin; Norman H. Giles, University of Georgia; M. M. Green, University of California, Davis; C. S. Levings, III, North Carolina State University; Barbara McClintock, Carnegie Institute of Washington; George P. Smith, University of Missouri; and Janine Zieg, University of California, La Jolla. For information contact Stadler Genetics Symposia, 117 Curtis Hall, University of Missouri, Columbia, Missouri 65201. A detailed program and proceedings from this as well as previous symposia are available for $5.00/volume plus 50¢ for postage.