gated HLA-DRB1 polymorphisms in the Chaouya and Berber-speaking Metalsa (ME) groups (4).

This population was in Hardy-Weinberg equilibrium for all the HLA loci studied. The normalized deviate of homozygosity (Fnd) was negative for all loci, and was significantly diverged from the neutral value for the HLA-B locus (Fnd= −2.640, p=0.0214), suggesting the operation of balancing selection (heterozygote advantage). Gene diversity was elevated (A locus: 0.92, B locus: 0.97, DRB1 locus: 0.94), as described in many African populations.

A total of 28 alleles were found at the DRB1 locus, the most frequent (present in at least 10% of the population) being DRB1*0701 (allele frequency (a.f.)=16.16%), DRB1*15011 (a.f.=12.62%) and the DRB1*03011 allele (a.f.=11.61%) (4).

By comparing Chaouya HLA-DRB1 polymorphism with that of other Moroccan populations, we identified some specific variants (DRB1*0101, *03021, *04011, *1103, and *08032) as well as some uncommon alleles (DRB1*03021, *1503, *1406, and *0806) in the Chaouya. Only the DRB1*03011 allele frequency differed significantly between the Chaouya and Metalsa (CH a.f.%=11.7; ME a.f.%=20.2, p=0.0311). These differences could be indicative of the distinct origins of the Berber and Arabic-speaking groups. As described in our genetic distance analysis (4), the Chaouya are closely related to Algerians, and then to the Metalsa, El Jadida and Souss groups, and to a lesser degree with Iberians, French and Ethiopians, confirming the historically documented common origin of these north African populations (4).

Of the 27 alleles identified at the HLA-A locus, the most frequent were A*02011 (a.f.=17.9%), A*01011 (a.f.= 12.7%) and A*3001 (a.f.=7.5%). Several alleles unique to Africans (A*0102, *0202, *3001, *3002, *3402, *6802, *7401, *8001) (5–9), as well as some variants previously observed at high frequencies in Spaniards (A*0101, 3001) and Orientals (A*2402, 2601) (5, 10) were observed. The novel A*3010 allele was observed in the Chaouya and submitted to GeneBank (January 2001, AF323494-6). The frequencies of the A*3001 (7.5% vs 1.4%, p=0.028) and A*3301 (5.6% vs 0.7%, p=0.05) alleles differed significantly from the Metalsa, and differences in the A*29 (6.7% vs 2.0%, p=0.057) and A*33 (2.1% vs 7.8%, p=0.047) allele groups were observed in comparison with Casablanca.

Of the 40 observed B locus alleles, the most frequently observed were B*5001 (a.f.=8.8%) and B*4403 (a.f.= 7.3%). Several alleles previously observed at high frequencies in Africa were recognized, (e.g., B*1503, *1510, *3508, *3910, *57031, *5301, *4102, *4201, *1403, and *5801) (5, 6, 11, 12, 13). We also observed alleles frequently present in Spaniards (B*0801), Mediterraneans (B*0801, 4403, 4901) (14) and Asians (B*5201, *4001), and defined the previously unknown B*1403 exon 4 sequence (November 2000, AF279664). Chaouya HLA-B polymorphism differed significantly from Casablanca for the B*45 (6.6% vs 0.45%, p=0.003) group, and from El Jadida for the B*44 (11.0% vs 5.3%, p=0.08) and the B*5(51,52) allele groups (5.8% vs 11.1%, p=0.05).

The most common HLA-A-B-DRB1 haplotypes observed in the Chaouya were A*0201-B*5101-DRB1*1501 and A*0201-B*5001-DRB1*0701, both occurring at a frequency of 3.03%. In addition to these, 11 other haplotypes appeared more than once.

The Chaouya shared some of the most common haplotypes (A*0201-B*4402-DRB1*0402 and A*2402-B*0801-DRB1*0301) with the Metalsa and a mixed Moroccan population from Casablanca (3) (A2-B50 and A68-B44), demonstrating common origins of these Moroccan Berber and Arabic-speaking groups. Nevertheless, this analysis highlights some unique genetic characteristics of Chaouya within Morocco and has demonstrated the influence of intermingling with various populations (4).

References

1. Grimes BF (eds): Ethnologue, 13th edition. Summer Institute of Linguistic Inc., 1996. Web site: www.sil.org/ethnologue/countries/Moro.html#MEY.
2. Gomez-Casado E, Del Moral P, Martinez-Laso J, et al. HLA genes in Arabic-speaking Moroccans: close relatedness to Berbers and Iberians. *Tissue Antigens* **55**, 239–249, 2000.
3. Choukri F, Chakib A, Himmich H, Raissi H, Caillat-Zucman S. HLA class I polymorphism in a Moroccan population from Casablanca. *Eur J Immunogen* **29(3)**, 205–211, 2002.
4. Oumhani K, Canossi A, Piancatelli D, et al. Sequence-based analysis of HLA-DRB1 polymorphism in Metalsa Berber and Chaouya Arabic-speaking groups from Morocco. *Hum Immunol* **63**, 129–138, 2002.
5. Geer L, Terasaki PI, Gjertson DW. Gene frequencies and world maps of their distributions. Chapter 7. In: Gjertson DW and Terasaki PI. HLA 1998, UCLA Tissue Typing Laboratory, 1998: 348.
6. Ellis JM, Mack SJ, Leke RFG. Diversity is demonstrated in class I HLA-A and HLA-B alleles in Cameroon, Africa: description of HLA-A*03012, 2612, 3006 and HLA-B*1403, *4016, *4703. *Tissue Antigens* **56**, 291–302, 2000.