HLA.DQ-ALPHA AND D1S80 DATA FROM A FRENCH CAUCASIAN POPULATION RANDOM SAMPLE VERSUS A SAMPLE OF AIRCRASH VICTIMS.

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Introduction

On January 20, 1992, an airbus A320 crashed in Strasbourg area : among the 90 passengers and the 6 crew, 87 died and 9 survived. Identification of the victims was investigated using conventional methods (dental records, physical and X rays examinations) and DNA fingerprinting. Then, the complete reconstitution of most heavy mutilated bodies was performed by DNA typing at the HLA.DQ-Alpha (1) and D1S80 (2) loci for all the human fragments. The HLA.DQ-Alpha and D1S80 data collected for 84 and 85 victims respectively were compared to the data obtained for a sample of individuals taken at random from the french caucasian population. Allele and genotype frequencies at the HLA.DQ-Alpha and D1S80 loci were determined by polymerase chain reaction (PCR) amplification.

Material and methods

HLA.DQ-Alpha locus : the random sample included 83 unrelated individuals randomly selected from the french caucasian population and the DNA was extracted from blood samples. Concerning the sample of aircrash victims only 84 into 87 victims could be typed at the HLA.DQ-Alpha locus and the DNA was extracted from 82 muscle samples and two bone samples. The amplification of the DNA (2 ng) and the identification of the alleles were performed using the Amplitype^{TM} HLA.DQ-Alpha forensic DNA Amplification and Typing Kit from Cetus (Cetus Corporation, CA, USA). PCR thermal cycles were carried out as indicated in the protocol of the kit and run in a Perkin-Elmer thermocycler.

D1S80 locus : the random french caucasian population sample numbered 108 randomly selected individuals and the aircrash sample was constituted of 85 victims. The amplification of the DNA (10 ng) was performed using the D1S80 Forensic DNA Amplification Reagent Set from Cetus (Cetus Corporation, CA, USA). PCR thermal cycles were carried out as indicated in the protocol of the kit. D1S80 alleles were identified on 1.5 % SeaKem GTG agarose gels after ethidium bromide staining.

Results

HLA.DQ-Alpha locus : the 6 different HLA.DQ-Alpha alleles (1.1 - 1.2 - 1.3 - 2 - 3 and 4) were identified for the french caucasian random sample and for the sample of aircrash victims. As observed in previous studies (3,4), the most frequent HLA.DQ-Alpha allele was allele 4 and the least frequent HLA.DQ-Alpha allele was allele 1.3 (fig. 1). The HLA.DQ-Alpha allele distribution determined from the aircrash sample was similar to that obtained with the french caucasian random sample (X^2 = 2.89 ; df = 5 ; $0.5<p<0.9$).The distribution of the HLA.DQ-Alpha genotypes (table 1) was in Hardy-Weinberg (HW) equilibrium for the french caucasian population sample (X^2 = 14.58 ; df = 15 ; $0.3<p<0.5$) as for the aircrash sample (X^2 = 14.8 ; df = 15 ; $0.3<p<0.5$). Population data comparisons were established by pooling all classes with less than 3 events and showed that the french caucasian random sample and the aircrash sample were similar : no significant differences appeared (X^2 = 12.34 ; df = 11 ; $0.3<p<0.5$).

D1S80 locus : 17 and 19 different D1S80 alleles were observed for the aircrash sample and the french caucasian random sample respectively. As observed previously (2) alleles 18 and 24 were highly represented (fig. 2). No significant differences appeared between both population samples as far as the allele distribution was concerned (X^2 = 12.2 ; df = 13 ; $0.5 < p < 0.9$). The observed (table 2) and expected D1S80 genotypes compared by the chi-square test showed conformity to HW expectations for the french caucasian random sample (X^2 = 20.76 ; df = 13 ; $0.05 < p < 0.1$) and for the aircrash sample (X^2 = 11.89 ; df = 9 ; $0.2 < p < 0.3$) and there were no significant differences between both population samples (X^2 = 2.63 ; df = 6 ; $0.5 < p < 0.9$).

Conclusion

HLA.DQ-Alpha and D1S80 PCR typing proved to be a very usefull tool for solving complex problems of identification. The application of the PCR method for the identification of the victims of the aircraft accident which occured in Strasbourg in 1992 resulted in the typing of 85 unrelated individuals. The population data showed that the sample gathering the victims of the aircrash could be considered as a sample of individuals taken at random in the french caucasian population.

References

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2) Budowle B, Chakraborty R, Giusti A, Eisenberg AJ and Allen RC (1990) Analysis of the VNTR locus D1S80 by the PCR followed by high-resolution PAGE. Am J Hum Genet 48 : 137-144.

3) Helmuth R, Fildes N, Blake E, Luce MC, Chimera J, Madij R, Gorodezky C, Stoneking M, Schmill N, Klitz W, Higuchi R and Erlich HA (1990) HLA.DQ-Alpha allele and genotype frequencies in various human populations, determined by using enzymatic amplification and oligonucleotide probes. Am J Hum Genet 47 : 515-523.

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Figure 1 : distribution of HLA-DQ alpha alleles in a french caucasian random sample (n=166) and in a sample of aircrash victims (n=168)

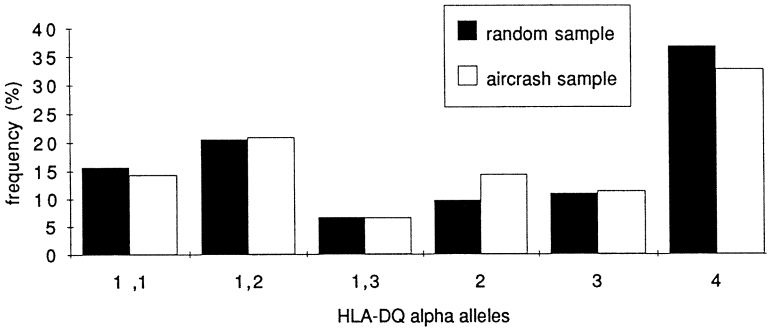

Table 1 : observed HLA-DQα genotype frequencies (%) in a frenc caucasian random sample of 83 individuals and in a sample of 84 aircrash victims.

OBSERVED GENOTYPES	RANDOM SAMPLE n	%	AIRCRASH SAMPLE n	%
1.1-1.1	1	1.20	2	2.38
1.1-1.2	9	10.84	4	4.76
1.1-1.3	1	1.20	--	--
1.1-2	2	2.40	6	7.14
1.1-3	1	1.20	3	3.57
1.1-4	11	13.25	7	8.33
1.2-1.2	4	4.82	3	3.57
1.2-1.3	4	4.82	3	3.57
1.2-2	3	3.60	7	8.33
1.2-3	1	1.20	3	3.57
1.2-4	9	10.84	12	14.28
1.3-1.3	--	--	--	--
1.3-2	1	1.20	2	2.38
1.3-3	2	2.40	1	1.19
1.3-4	3	3.60	5	5.95
2-2	--	--	1	1.19
2-3	4	4.82	3	3.57
2-4	6	7.23	4	4.76
3-3	1	1.20	3	3.57
3-4	8	9.64	3	3.57
4-4	12	14.46	12	14.28
Heterozygotes	n = 65	78 %	n = 63	75 %
Homozygotes	n = 18	22 %	n = 21	25 %
Allelic diversity (h)		0.78		0.79
Power of discrimination (PD)		0.91		0.92

Figure 2 : distribution of D1S80 alleles in a french caucasian random sample (n=216) and in a sample of aircrash victims (n=170)

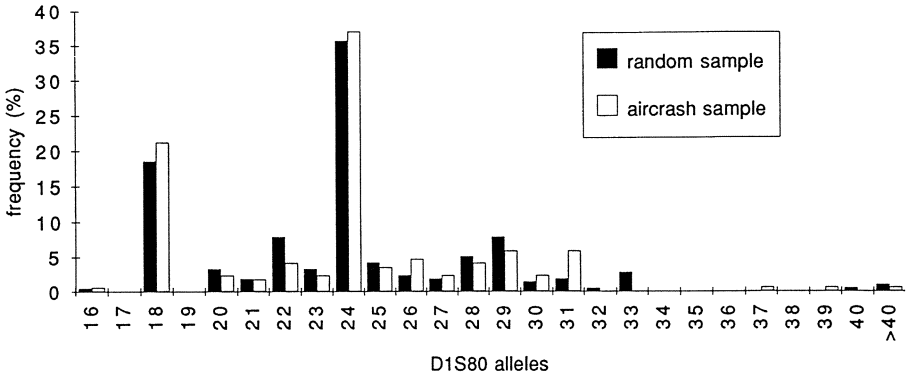

Table 2 : observed D1S80 genotypes in a french caucasian random sample of 108 individuals and in a sample of 85 aircrash victims .

OBSERVED GENOTYPES	Aircrash Sample	Random Sample	OBSERVED GENOTYPES	Aircrash Sample	Random Sample
16-23	1	0	22-25	0	3
16-24	0	1	22-26	1	0
18-18	3	4	22-28	1	0
18-20	0	2	22-29	0	2
18-22	1	4	22->40	0	1
18-23	2	2	23-24	1	2
18-24	16	13	24-24	10	12
18-25	3	1	24-25	2	4
18-26	1	1	24-26	2	0
18-28	2	3	24-27	3	2
18-29	2	1	24-28	3	6
18-30	1	1	24-29	4	8
18-31	1	1	24-31	5	2
18-32	0	1	24-34	0	4
18-34	0	1	24-39	1	0
18-37	1	0	25-31	0	1
20-24	3	3	26-26	1	1
20-30	0	1	26-29	1	1
20-31	1	0	26->40	1	1
20-40	0	1	27-29	0	2
21-23	0	1	28-29	1	2
21-24	1	3	29-30	1	1
21-25	1	0	29-31	1	0
21-27	1	0	29-34	0	1
22-22	1	0	30-31	1	0
22-23	0	2	31-31	1	0
22-24	2	5			