False Paternity Trios in white, black and Cape Coloured populations.

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Introduction:

The populations of the Western Cape region are mainly white, black (Xhosa) and the Cape Coloured (CC). The CC population are of mixed genetic background, from white, black, Khoisan and Oriental (Malay) origins. The CC is situated at some genetic mid-point between white and black groups for most genetic systems tested (1,2).

In parentage testing, one is often faced with results that reflect the presence of unusual genes for the declared race of the accused man, but genes that are not unusual for another man in the same region, but from a different race.

Methods:

False trios within the three races were created to test the power of exclusion (PE) in the 18 loci used in paternity casework. Unexcluded fathers (n = 1193) were moved down in the database according to race and date tested (January 1989 to July 1993). In 333 cases, no serum proteins or red cell enzymes were done, and they were matched within their own groups.
The PE of cases combined into three groups viz: i) HLA, ii) blood-groups and iii) red cell enzymes + serum proteins, was determined.
The Paternity Index (PI) of false fathers not excluded by HLA was calculated for the HLA system only and expressed as W% and then recalculated using the gene frequencies of the other two races.

Results:

Table 1: PE of individual systems.
The PE of HLA (94.17%) in whites was similar to those reported for American whites (94.4% and 93.5%; 4,5). The PE for HLA in blacks (96.63%) was higher than the 92.2% reported for American blacks (5).

In all HLA unexcluded false-father cases, the child had one or more blank antigens. In addition, all the white children except one, had one or more of the common white HLA-A1, A2 and A3 antigens as previously found in HLA non-exclusions (4).

The PE of the MNS, Rh, ACP1, ESD and Kell systems decreases from white to black to CC and the PE of the BF, HP, ABO, GLO and Duffy systems increases from white through CC to black, similar to findings in actual case work in the same groups (2,3). DBP is the most useful system after HLA and ranks 2nd in white and CC, but 9th in blacks.

Table 2: The combined PE in false trios.
The combined PE is 99.88% using HLA, blood groups as well as enzymes and proteins. A very high PE (> 99%) is reflected in all three race groups testing only enzymes, proteins and HLA.

Table 1 :

EXCLUSIONS PER INDIVIDUAL SYSTEM IN FALSE TRIOS IN RANK ORDER[1]							
WHITE (n = 74)		CAPE COL. (n = 244)		BLACK (n = 15)		TOTAL[2] (n = 333)[3]	
SYSTEM	%	SYSTEM	%	SYSTEM	%	SYSTEM	%
HLA	94.17	HLA	97.56	HLA	96.63	HLA	96.48
DBP	32.75	DBP	44.57	PGM1	28.92	DBP	33.06
PGM1	30.57	PGM1	31.43	BF	22.47	PGM1	30.43
MNS	26.21	MNS	25.82	MNS	22.39	MNS	25.15
Rh	25.41	BF	25.38	ABO	20.98	BF	23.30
ACP1	22.61	Rh	23.57	HP	19.19	Rh	22.37
BF	20.87	HP	19.15	GLO	19.09	HP	19.52
HP	20.39	ABO	17.97	Rh	16.42	ABO	18.67
ABO	16.83	ACP1	17.44	DBP	16.40	ACP1	18.02
GLO	14.55	GLO	15.67	Fy	15.09	GLO	16.38
ESD	11.40	Fy	15.57	ACP1	14.68	Fy	13.51
C3	9.09	C3	11.65	C3	10.96	C3	10.74
Fy	8.03	ESD	7.80	CA2	7.54	ESD	7.39
TF	4.62	CA2	2.19	ESD	3.17	CA2	3.17
Kell	3.24	TF	1.92	TF	2.74	TF	2.89
CA2	0	Kell	0.65	Kell	0	Kell	1.18

[1] January 1989 - July 1993.
[2] White = 309; Cape Col. = 616; Black = 268; Total = 1193.
[3] Cases with only HLA and Blood Groups.

Table 2 :

	CASES EXCLUDED IN GROUPED SYSTEMS IN FALSE TRIOS[1]							
Grouped Systems	WHITE	%	CAPE COL.	%	BLACK	%	TOTAL[2]	%
HLA	221	94.04	359	96.51	243	96.43	823	95.81
Blood Groups	156	66.38	207	55.65	145	57.54	508	59.14
Enzymes + Proteins	191	81.28	306	82.26	184	73.02	681	79.28
HLA + Bl. Gr.	230	97.87	365	98.12	249	98.81	844	98.25
HLA + Enz. + Prot.	233	**99.15**	370	**99.46**	251	**99.60**	854	**99.42**
Bl. Gr. + Enz. + Prot.	213	90.64	338	90.86	228	90.48	779	90.69
HLA + Bl. Gr. + Enz. + Prot.	235	100	371	99.73	252	100	858	99.88

[1] Cases where only HLA and Blood Group results were available were excluded from this analysis.
[2] White = 235; Cape Col. = 372; Black = 252; Total = 859.

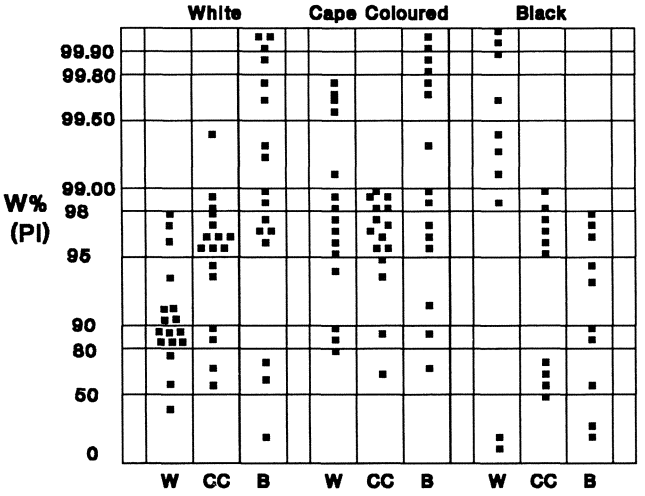

Figure 1. **43 HLA unexcluded men: PI re-calculated.**

Figure 1: The PI, calculated using own race and substituting other races in HLA unexcluded men.
The lower PI in the white group (80 - 91) is again consistent with previous findings in whites and is due to antigen sharing between alledged father and mother, mainly HLA-A1, A2 and A3 or the presence of blanks (6). The PI of false fathers not excluded by HLA, in whites, CC and blacks are all below 98.99%, but increases to levels approaching real fathers if the wrong gene frequencies are used.

Conclusion:

Although it has been the impression that the CC fall genetically midway between white and black, it is quite clear from the data in the middle column in Figure 1, that the CC group has acquired a genetic identity of their own, even if they fall midway between black and white. In our casework, it is appropriate to compare gene frequencies in other races, especially when the PI is extremely high due to unusual genes in the putative father and these genes are common in other populations in the same region. These findings will have to be verified using actual casework.

References:

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