

Investigation of the use of DNA Probes L336 and YNH24 in Problems of Doubtful Parentage

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The application of the DNA probes L336 (from Collaborative Research Inc.), YNH 24 (Promega) and Mucin, MR24 and 3'α HVR (from Amersham International) was investigated in a series of families requesting parentage tests. The bands present in a putative parent's DNA may be used as part of the probability calculation of his biological relatedness to the child if allowance is made for the continuous variability of band size in the population and the inaccuracy of the methods for measuring band size. This was done by estimating the level of variation seen when repeated measurements were made of the band sizes in individuals on consecutive occasions and in parent/child pairs. The range of band sizes including the measured one was taken in order to determine the frequency of the band from the published tables for L336. The probability of relatedness derived from this frequency was then compared with the results obtained from the use of a wide range of conventional phenotypic polymorphisms (see Results Table I).

Using the four probes YNH 24, 3'α HVR, Mucin and MR24 the results whether or not an exclusion was found by visual examination of the autoradiographs was compared with the result of the conventional tests. These data are shown in Results Table II.

#### CONCLUSIONS

A high level of agreement was found between the results obtained using DNA probes and those from the conventional phenotypic polymorphisms in that (except in five cases) exclusions were not found using one method and not the other. Of these exceptional cases in three the conventional systems showed an exclusion and the single DNA probe used failed to do so. In one, the probe L336 showed an exclusion when the conventional systems had failed to do so, and in one the apparent discrepancy is probably the result of an unusual red cell antigen.

We consider that the use of a range of DNA probes in conjunction with the conventional polymorphisms will offer a very high compound chance of producing evidence of exclusions and will provide a powerful tool to investigate parentage problems.

Table I Results from conventional blood group systems and DNA using L336

This Table compares the figures for the probability of the father's biological relatedness to the child (PI and RCP) derived from the conventional blood group polymorphisms with those derived from the L336 DNA polymorphism. The compound figures using both types of polymorphism together are also shown. Probability figures are also shown for L336 where it failed to produce evidence of exclusions in cases 35, 37 and 42.

	BLOOD GROUPS		L336		TOTAL	
	PI	RCP	PI (1%)	RCP	PI	RCP
1	95	99	19.9	95.2	1,891	99.947
2	745	99.87	10.5	91.3	7,823	99.987
3	380	99.7	2.3	69.7	874	99.886
4	6,186	99.98	17.5	94.6	108,255	99.9991
5	14,820	99.99	17.5	94.6	259,350	99.9996
6	1,166	99.91	2.3	69.7	2,682	99.963
7	1,687	99.94	9.9	90.8	16,701	99.994
8	200	99.5	13.5	93.1	2,700	99.963
9	5,000	99.98	3.1	75.6	15,500	99.994
10	9,000	99.99	105.0	99.1	945,000	99.9999
11	86	99	15.5	93.9	1,333	99.925
12	200	99.5	5.1	83.6	1,020	99.902
13	162	99.39	28.6	96.6	4,633	99.978
14	161	99.39	37.7	97.4	6,070	99.984
15	309	99.68	5.9	85.1	1,761	99.943
16	189	99.47	10.0	90.9	1,890	99.947
17	482	99.79	9.0	90.0	4,338	99.977
18	289	99.66	65.1	98.5	18,814	99.995
19	2,300	99.96	2.3	69.7	5,290	99.981
20	135,800	99.999	5.1	83.6	692,580	99.9998
21	3,000	99.97	14.1	93.4	42,300	99.998
22	13,000	99.99	10.5	91.3	136,500	99.9993
23	412	99.76	14.0	93.3	5,768	99.983
24	300	99.67	11.2	91.8	3,360	99.970
25	419	99.76	15.5	93.9	6,495	99.985
26	161	99.38	11.2	91.8	1,803	99.945
27	4,402	99.98	10.5	91.3	46,221	99.998
28	203	99.51	18.5	94.9	3,756	99.973
29	24,500	99.996	18.0	94.7	44,100	99.9998
30	104	99.05	8.7	89.7	905	99.8890
31	1,150	99.91	55.5	98.2	63,825	99.998
32	902	99.89	410.0	99.8	369,820	99.9997
33	5,840	99.98	189.0	99.5	1,103,760	99.9999
34	56	98.2	44.9	97.8	2,514	99.960
35	Excluded		9.5	90.5		
36	Excluded		Excluded			
37	Excluded		7.9	88.8		
38	Excluded		Excluded			
39	Excluded		Excluded			
40	412	99.76	Excluded			
41	Excluded		Excluded			
42	Excluded		7.6	88.4		

Table II Results from conventional tests and DNA testing using four single locus probes

In this Table the probability figures for cases where no exclusion was found using the conventional blood group polymorphisms are shown. The results using the four DNA probes on the same cases show whether or not evidence of an exclusion was found. In the cases where exclusions were found using the conventional systems they were also found using the DNA probes. In case No 38 involving a second order Duffy exclusion and an apparent discrepancy between the conventional and DNA polymorphisms, the investigation is incomplete.

	CONVENTIONAL		DNA			
	PI	%RCP	$\alpha$ globin 3'HVR	Mucin HVR	MR24/1 HVR	YNH24
1	175	99.4	+	+	+	+
2	160	99.4	+	+	+	+
3	3,800	99.97	+	+	+	+
4	6 million	99.9999	+	+	+	+
5	34,000	99.997	+	+	+	+
6	73,000	99.998	+	+	+	+
7	7 million	99.9999	+	+	+	+
8	1,470	99.93	+	+	+	+
9	24,000	99.996	+	+	+	+
10	80	98.8		+	+	+
11	22	95.7		+	+	+
12	690	99.85	+	+	+	+
13	1,000	99.9		+	+	+
14	1,700	99.4	+		+	+
15	1	50.0	+	+	+	+
16	90	98.9	+	+	+	+
17	32	96.9	+	+		+
18	21	95.5	+	+		+
19	5	83.3		+	+	
20	500	99.8	+	+	+	+
21	5,000	99.98	+	+	+	+
22	75	98.7	+	+	+	+
23	1,900	99.95		+		+
24	3,400	99.97		+		+
25	8,000	99.98		+		+
26	30,000	99.997				+
27	300,000	99.9997				+
28	61,000	99.998				+
29	186	99.5		+		+
30	50	98.0		+		
31	7,700	99.99		+		+
32	10,000	99.99		+		
33	Exclusion			Ex	Ex	Ex
34	Exclusion		Ex	Ex		Ex
35	Exclusion		Ex	Ex		Ex
36	Exclusion		Ex	Ex	+	Ex
37	Exclusion			+		Ex
38	2 <sup>o</sup> Excl. PI = 106		+	+	+	+

KEY: + = no evidence of exclusion