THE ASSOCIATION OF INDIVIDUAL SOCIODEMOGRAPHIC FACTORS WITH PATERNITY TEST RESULTS

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Introduction

The paternity testing laboratory has available to it information other than the laboratory results regarding the tested individuals. This accessory data relates to sociodemographic factors which are requested prior to the testing. Analysis of these factors in our institution was undertaken to determine if there was an association between one or more of these factors and the outcome of the laboratory analysis as determined in our laboratory.

Method

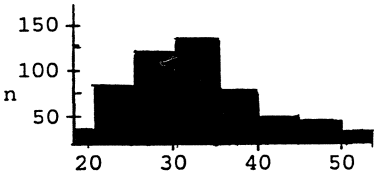
The study group consisted of 500 consecutive cases from our files in which the testing was performed between the years 1986-1993. During this time, each individual was tested for genetic markers in multiple genetic systems. The systems utilized included traditional laboratory antigens, the HLA system and RFLP-DNA systems. The combined power of exclusion was, on the average, 99% or higher. The overall observed exclusion rate in the total study group of 500 cases was 35.6%.

Subgroups of the total study cases were identified based upon sociodemographic factors in order to determine whether or not the exclusion rates of the subgroups would differ from each other or from that of the overall exclusion rate.

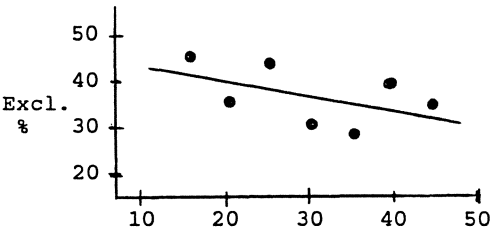
Results

	Total Observations	Exclusions No.	(%)	p value
Race of trio				.27
White	362	124	34	
Black	116	48	41	
Other	22	6	27	
Surname of trio				.043
AF M C				
*D S S	278	90	32	
S S S	111	51	46	
S D S	52	15	29	
D D D	32	10	31	
S S D	15	8	53	
Payer				.035
AF	186	77	41	
M	33	14	42	
AF/M	21	3	14	
Court or unknown	258	84	33	
Court ordered				.0002
No	373	151	40	
Yes	126	27	21	
Charge for tests				.572
Lower	214	73	34	
Higher	286	105	37	

*D = different, S = same



Average Age of AF & M



Average Age of AF & M

The exclusion rates tended to be somewhat higher when the alleged father (AF) and mother (M) were young with a gradual decrease in exclusion frequency in older couples. No significant differences in exclusion rates were found among subgroups, based upon racial origin, of the total study population of trios. Subgroups based upon surnames of the trio differed from each other (p=0.043). The most significant differences were between DSS vs. SSS (p=0.01) and SDS vs. SSS (0.04). These probably represent divorce actions. When AF or M paid for the test, the exclusion rate was higher than when they shared in the cost (p=0.018). If the court ordered the test to be done, the exclusion rate was lower than when it was not a court ordered case (p=0.002). Midway through the study period, the charge for the test was greatly increased. The exclusion rates before and after the charge increase did not differ significantly.

Discussion

The overall exclusion rate observed in our Laboratory during the study period of 1986-1993 was 35.6% which is higher than the reported national average of 27-30% in the United States.[1] This high exclusion rate is probably related to the mix of trios in our case work population, rather than our combined average power of exclusion (PE), since most all laboratories performing parentage tests in the U.S. have average PE values which exceed 95%.[2] Examination of the subgroups in our study population reveals that in 23% of the trios, the AF, M and C all have the same surname. This is due to the fact that our laboratory does not participate in state or regional contract work for welfare cases so that we have a high proportion of private pay and divorce cases.

High exclusion rates were reported from divorce cases in 1976 by Dykes and Polesky in the U.S.[3] Valentin, Henningsen, Nijenhuis, Mayr, Martin, and Salmon all reported high exclusion rates in divorce cases in Europe at the Airlie Conference in 1982.[4]

Lower exclusion rates in court order cases have been reported by Lincoln in England and Nijenhuis in the Netherlands.[4] Our testing results in both of these categories (same surnames and court ordered) also follow these patterns of observations.

Professor Hummel surveyed the exclusion experience in different countries and geographic areas in Europe and found that exclusion rates varied in 1974-1978 according to country, with the highest rate of exclusions in Austria and the lowest rates in Denmark.[5] He suggested that these differences are probably not related to differing PE values, legal or political systems, gene frequencies, sample size or illegitimacy frequencies. He concluded that in one-man-one-child cases in German speaking areas of Europe that high exclusion rates are probably due to concealment of promiscuity by the mother or uncertainty about the identity of the true father rather than the intentional naming of false fathers.

Experts in parentage testing agree that the posterior probability of paternity cannot be derived without a prior probability. The Essen-Möller formula, W=1/(1+Y/X) does not contain a specific value for the prior and thus it assumes a neutral prior of 0.5.[6]

Hummel, Conradt and Kundinger have given a modification of the Essen-Möller formula to include a realistic prior probability and suggested that a realistic prior, the non-exclusion frequency, be used.[6]

Elston has stated that the expert scientist has an obligation to consider the validity of all assumptions used in probability estimates and that anything less constitutes scientific fraud and fraud to the court.[7] He has suggested that the report could give the probability of paternity over a range of priors. This, in fact, has also been recommended by Ellman and Kaye[8] and is in keeping with the summary recommendations of the Parentage Testing Committee of the American Association of Blood Banks following the Airlie Conference.

Most laboratories in the U.S. continue to use the neutral prior of 0.5 in their case work. However, if a realistic prior is to be used, each laboratory should be aware of possible subgroup differences of the priors within their experience.

References

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