

RESULTS OF DNA ANALYSIS FROM SIX FORENSIC SCIENCE LABORATORIES IN GERMANY

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Introduction

In 1987 a DNA working group of three German forensic science laboratories was founded in order to establish the DNA analysis in routine case work. The members of this group came from the state labs of Berlin, of Baden-Württemberg, Stuttgart, and the federal lab (BKA) in Wiesbaden. In October 1989 these three laboratories started to use DNA analysis in case work. Scientists of other German state labs (table 1) started DNA profiling in 1990 or at the beginning of 1991 after having been trained by members of the working group. The results of DNA analysis in this paper are based on the work of six forensic science labs in Germany.

Methods

A modified version of Gill's method for DNA preparation and separation by electrophoresis in 0,8 % agarose gels was used (Gill et al.). Hybridization was carried out according to Smith et al. Single locus probes MS 1, MS 31, MS 43 A and G 3 (Wong et al.) from ICI/Cellmark were used sequentially. Allele sizes of DNA fragments were calculated by reference of DNA size markers labelled with ^{35}S (Amersham).

Results

Table 1 shows that a total number of 216 cases was analyzed with the DNA profiling method by the six above mentioned laboratories from October 1989 till March 1991.

The majority have been rape cases. Although even small and very aged stains (up to several years old) were used, DNA profiles have been obtained in approximately 78 % of these cases. A match of suspect samples with crime stains was observed in 55 % and an exclusion of all suspects in about 19 % of the cases.

No results were obtained in about 22 % of the cases due to insufficient or totally degraded DNA isolates. No suspects were known in 4 % of the cases. These data are comparable to those of other European labs.

Table 2 and Table 3 show the data from the forensic science lab in Stuttgart, where a comparison between conventional stain analysis (for example ABO, PGM, Gc etc.) and DNA results was done. The importance of the DNA method is clearly shown by the fact, that in rape cases within the group of suspects which could be excluded by DNA profiling (Table 3) more than 50 % could not be excluded by conventional systems alone. In one extreme case a suspect was incriminated by ABO, PGM and Gc systems (frequency 1 : 1000) but could be excluded by DNA analysis (Fig. 1).

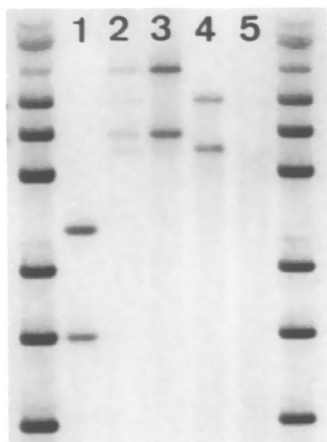


Fig. 1: Exclusion of a suspect by RFLP analysis using probe MS 43 A.

lane 1: suspect (OSe / PGM 1+ / Gc 2)
 lane 2: stain of semen/vaginal secretion
 lane 3: stain of semen (H, Le b / PGM 1+ / Gc 2)
 lane 4: victim (BSe / PGM 1+1- / Gc 2-1S)
 lane 5: supernatant of stain in lane 2

At the left and the right side are two ^{35}S -standards (Amersham)

References

- Gill, P, Jeffreys, AJ and Werrett, DJ (1985) Forensic application of DNA fingerprints.
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- Wong, Z, Wilson, V, Patel, I, Povey, S and Jeffreys, AJ (1987) Characterization of a panel of highly variable minisatellites cloned from human DNA.
 Ann. Hum. Genet. 51: 269 - 288

Table 1 Results of DNA analysis (RFLP-SLP) *

	rape cases	others	Inclusion	Exclusion	DNA neg.	no suspect in case
Landeskriminalamt Baden-Württemberg	61	19	44	18	14	4
Bundeskriminalamt Wiesbaden	38	5	19	10	10	4
Landeskriminalamt Berlin	22	7	15	5	8	1
Landeskriminalamt Niedersachsen	10	30	27	5	8	-
Bayerisches Landeskriminalamt	11	6	8	3	5	1
Landeskriminalamt Rheinland-Pfalz	5	2	5	-	2	-
Sum	147	69	118	41	47	10

* The above case statistics gives only a limited information about the number of analyzed stain material and blood samples. In most cases several stains and blood samples (sometimes up to 20 - 50) were analyzed.

Table 2 Inclusions-suspect sample matches crime stain

weighting of evidence	DNA analysis (RFLP-SLP)	conventional systems (like ABO, PGM, Gc etc.)
must have come >1:1 Million	44	-
could have - very likely to have 1:2 - 1:5000	-	18
not to exclude (suspect phenotypes allows no differentiation from stain profile)	-	16
no results	-	10

Table 3 Exclusions-suspect sample differs from crime stain

weighting of evidence	DNA analysis (RFLP-SLP)	conventional systems (like ABO, PGM, Gc etc.)
Exclusion	18	6
not to exclude (suspect phenotypes allows no differentiation from stain profile)	-	8
no results	-	4