

Evaluation of stain cases of the Swiss DNA Database

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Abstract. Since the Swiss federal DNA profile information system (EDNA) has been launched in July 2000 the number of stain cases increased considerably: 337 cases in 1999 compared to 1386 cases in 2001. Before the Swiss DNA database was in use, stain cases were examined only if a suspect was present. Now also stain cases with unknown perpetrators are being examined. In this study 500 stain cases comprising 1270 single stains from 2001 were evaluated. From 1270 stains 1104 were analyzed by PCR (18% were mixed profiles), 837 displayed a DNA profile and finally 395 were entered into the database. A total of 224 of 395 profiles (57%) that were entered into the database resulted in a hit. The changes in types of stains and crime categories as a result of the implementation of the database are documented and discussed. © 2003 Elsevier B.V. All rights reserved.

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1. Introduction

The Swiss DNA database is operational since July 2000. DNA profiles of persons who are suspected of having committed a crime according to the Swiss crime catalogue and DNA profiles of stains from unknown perpetrators are entered into the database [1].

The goal of this study was to evaluate to what extent the implementation of the DNA database has changed our case material (type of stain and crime category) and to find out the success rate of the database. Therefore 500 stain cases comprising 1270 single stains from 2001 were evaluated and the results were compared with 205 stain cases investigated before the Swiss DNA database had been launched [2].

2. Material and methods

DNA from the 500 stain cases was extracted according to standard procedures and amplified using the commercially available Multiplex PCR kit AmpF/STR SGM Plus.

3. Results

3.1. Types of stains and crime category

A total of 505 of the 1270 examined stain samples were from touched objects, e.g. from hafts of tools and weapons, gloves and clothes (so-called contact stains). The second

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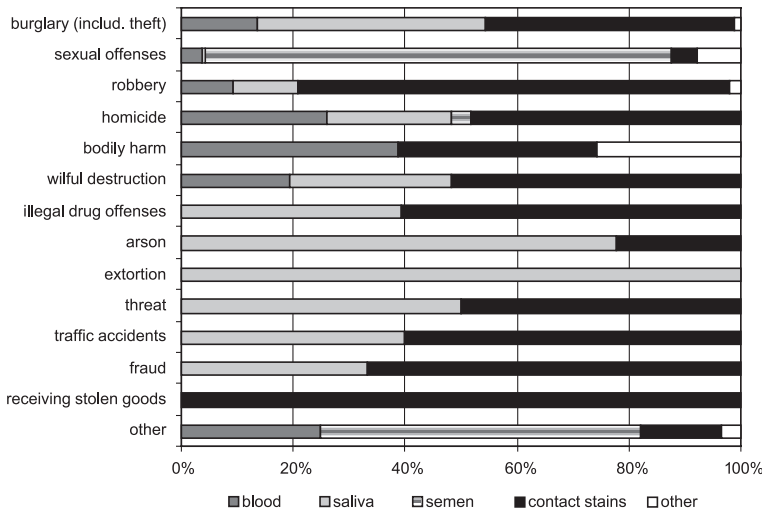


Fig. 1. Distribution of types of stains among crime categories.

category was saliva stains (380 samples), followed by semen (199 samples) and blood stains (149 samples). The remaining 37 samples originated from tissues, hairs, fingernails, faeces and urine. Fig. 1 illustrates how the different types of stains were distributed among the crime categories. Only contact stains and saliva stains could be found in nearly all crime categories.

3.2. Results of STR typing

From the 1270 stain samples 166 were not subjected to a DNA analysis mainly because preliminary tests to detect the presence of blood, saliva or semen were negative or the client only required the results of the preliminary tests. 1104 stains were subjected to a DNA

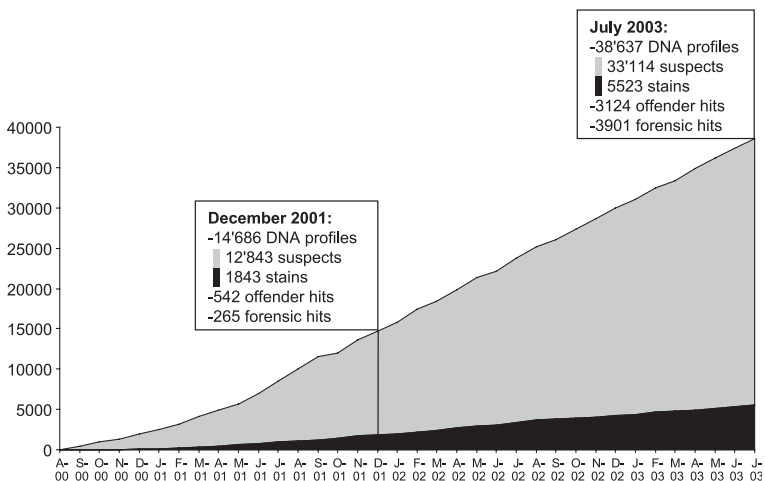


Fig. 2. Number of DNA profiles in the Swiss DNA database since August 2000.

analysis, whereof 837 were successful. The analysis of 267 samples provided no result. Most of the 837 successfully typed samples showed male profiles (562 samples), 73 showed female profiles and about one quarter of the samples (202) resulted in mixed profiles.

A total of 395 of the 837 DNA profiles were entered into the Swiss DNA database. For the inclusion of a DNA profile into the database a minimum of six typed STR loci and for mixed profiles a minimum of eight loci limited to four alleles per locus is required. 442 DNA profiles were not sent to the database for the following reasons: several typed samples resulted in identical DNA profiles, the PCR analysis results were inconclusive or not interpretable or the obtained DNA profiles did not fulfil the admission requirements.

3.3. Hits and success rate

395 DNA profiles were sent to the Swiss DNA database for data recording and comparison. 57% of the profiles that were entered into the database resulted in hits. 36% of the DNA profiles complied with the DNA profile of a person and resulted in the identification of the perpetrator. Several crime scenes could be linked by stain-to-stain hits (21% of the DNA profiles). Considering the 1104 stains subjected to a DNA analysis not counting the 372 identical profiles within the cases, about every third stain sample resulted in a hit.

4. Discussion

The implementation of the Swiss DNA database led to a considerable increase of examined stain cases (337 cases in 1999 compared to 1386 cases in 2001). Now also stains from crime scenes with unknown perpetrators are being examined. In comparison to an evaluation study investigating stain cases from 1991 to 1994 a new type of stains now dominates the case material: the contact stains. They even represent the main part (39%) of the routinely analyzed stains, followed by saliva (30%), semen (16%) and blood stains (12%). In former times blood stains (64%) made up the majority of the analyzed stain samples corresponding to the then major crime category “homicide”. Nowadays the major crime category is “burglary and theft” with the contact stains as the largest group of analyzed stain samples.

5. Actual statistical data and outlook

The actual statistical data from the Swiss DNA database are shown in [Fig. 2](#). Every month approximately 1400 profiles (1100 from suspects and 300 from stains) are entered into the database. At the end of July 2003 the total number of profiles from suspects in the database was 33,114 and the number of stain profiles amounted to 5523. Since the start of the database in July 2000, 3124 hits between profiles from persons and stains allowed the identification of the unknown perpetrators. In addition 3901 forensic hits were reported.

References

- [1] M. Strehler, A. Kratzer, W. Bär, Swiss federal DNA profile information system, *Progress in Forensic Genetics*, vol. 9, Elsevier Science B.V., Amsterdam, 2003, pp. 777–781.
- [2] D. Boller, *Die Analyse von Kriminalspuren mit der PCR-Technik (1991-1994)*. Dissertation Med. Fakultät der Universität Zürich, 1998.