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A DATABASE APPROACH FOR STATISTICAL ANALYSIS OF BIOLOGICAL AND DNA EVIDENCE IN SEXUAL ASSAULT CASES

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In the biology section of our laboratory, casework management is entirely computerized in a FileMaker database (DNA Pro-FILES), from case reception to preliminary testing, integrated operation of automated platforms for DNA analysis and report formatting. A new module has recently been added to this database, allowing the assembly of all data related to sexual assault (SA) cases: general information from the case, medical examination of the complainant, preliminary tests and DNA results (ProfilerPlus®/Cofiler®), CODIS matches, etc. The module is a very powerful and versatile tool that can be interrogated for any combination of parameters.

Using this database, we have undertaken a large-scale study on the proportion of SA cases received in our laboratory where an interpretable DNA profile, presumably originating from the assailant, could be obtained. The study focuses on cases where a standardized kit for the collection of SA evidence was used and submitted to our lab alone or with other types of exhibits. Several hundred SA cases submitted to our laboratory between 2003 and 2007 have been reviewed and the data entered into the database.

We find that the overall proportion of SA cases where a relevant, interpretable DNA profile could be obtained is close to 50%. The success rate for the SA kit bodily samples is approximately 30% while for 20% of the cases an alleged profile from the assailant could be obtained only from other exhibits submitted with the kit, such as panty liners, condoms, bedding or clothing.

We have looked at the success rate of the DNA analysis in relation to the age of the victim, the bodily sample types, the time elapsed between the assault and the medical examination, and the results of preliminary tests. Approximately 50% of SA cases from teenagers and adults ($\geq$ 11 years old) gave a relevant DNA profile. The success rate of DNA analysis is much lower for children 10 years-old or younger, but still quite significant, with 15% of cases giving a relevant profile. Profiles in these cases were found mostly on clothing or skin swabs.

From 20% to 35% of vaginal samples (swabs and washes) taken up to three days after the assault gave a relevant DNA profile. The proportion of vaginal samples with a profile drops dramatically (5%) when the delay between assault and sampling exceeds 3 days. For anal/rectal swabs, a DNA profile was obtained from approximately 20% of swabs taken less than 1 day after the assault, but from less than 5% of swabs taken later. Fewer than 10% of oral washes gave a DNA profile, the vast majority having been collected within 12 hours of the assault.

We have investigated the success rate of DNA analysis for samples with negative preliminary tests results. We estimate that the probability of obtaining a relevant DNA profile from a vaginal swab with no detectable acid phosphatase (AP) is 15%. A number of AP-negative swabs with relevant DNA were also negative for other tests, such as PSA or spermatozoa search. AP-negative swabs represent approximately a third of the vaginal swabs that provided relevant DNA profiles.

The database module that allowed us to perform this study is a very versatile tool for gathering all information from SA cases and searching any combination of parameters. Analysis can be further expanded to a variety of additional criteria that may not be strictly forensic, such as the use of a condom or not, the intoxication of the victim, the results of the medical examination (genital lesions, etc), the relationship between the complainant and the assailant, the location of the assault (private dwelling or public place), the nature of the sexual acts, etc. This database tool will provide us as well as nurses, social workers and other SA workers in Quebec with much needed information to optimize medical, forensic and social intervention procedures in SA cases.