CASE REPORT

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Blood Grouping in a Sexual Assault Case: Criteria and Methodology for Genetic Marker Analysis

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ABSTRACT: A sexual assault case was received in the laboratory. Upon examination, a small bloodstain was located on a bed sheet that was recovered from the defendant's motel room. Typing the whole blood samples from the defendant and the victim revealed that both blood samples exhibited identical phenotypes in eleven different genetic markers. Gm(1) and Gm(2) analysis was then performed on the two whole blood samples which provided discrimination between the two parties.

KEYWORDS: criminalistics, genetic typing, criminal sex offenses, Gm blood grouping, discrimination, profiling

An eleven-year-old girl was abducted by a male from a fairground and taken to his motel room. There she was sexually assaulted resulting in bleeding caused by vaginal trauma. Information given to the local police by the victim allowed a suspect to be located and arrested. Numerous items of evidence were then recovered from the defendant's motel room and delivered to the forensic science laboratory for examination.

Laboratory Findings

A small bloodstain was located on the top bed sheet that was recovered from the defendant's motel room. Whole blood samples from the defendant and the victim were requested. Upon receiving the blood samples, they were profiled in eleven genetic markers and found to have identical phenotypes in each genetic marker tested. The evidence stain was kept frozen in liquid nitrogen during this time period for preservation of the genetic markers present in the stain. Preserving the evidence stain until the whole blood samples were profiled allowed the stain to be typed in those genetic markers that allowed for maximum discrimination and conserved as much of the stain as possible.

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Further Analysis

Whole blood samples from the victim and defendant were typed for the Gm(1) and Gm(2) antigens which showed a phenotypic variation between defendant and victim. The evidence stain was then removed from liquid nitrogen and gamma marker antigens analysis was performed. This analysis showed that the bloodstain found on the defendant's bed sheet could have originated from the victim and did not originate from the defendant himself (Table 1). The stain was further analyzed in other genetic markers to eliminate the possibility of having the bloodstains originate from a third party since this took place in a motel room. The bed sheet was recovered from a motel room where turnover of people is high. Upon issuing a report, the defendant pleaded guilty and was sentenced.

Discussion

To date there are about 27 Gm antigens known. Some Gm antigens such as Gm (1), (2), (5), and (10) have been detected in dried stains [*1-3*]. In this particular case Gm(1) and Gm(2) were the antigens that resolved the case. The evidence stain was small in size and did not allow unlimited analysis. To utilize the bloodstain evidence most effectively, the whole blood samples of the parties involved were first profiled. This allowed the phenotypes of the parties to be compared before any bloodstain evidence was consumed. The genetic marker that differentiated the defendant's and victim's blood was then typed first. The remaining sample was then analyzed using criteria that would select genetic markers most likely to be useful and yield the greatest discrimination possible from the overall population.

Summary

The systematic approach used in this case is recommended for any bloodstain analysis involving two or more individuals, especially when the amount of bloodstain evidence

TABLE 1—*Genetic marker analysis performed on whole blood samples from the victim and defendant.*

Description	ABO	Esterase D	Phosphoglucomutase	Erythrocyte Acid Phosphatase	Adenylate Kinase	Adenosine Deaminase	Haptoglobin	Group Specific Component	Gamma Marker Antigens
Blood sample from victim	0	1	1	B	1	1	2-1	1	−1, −2, +10
Blood sample from defendant	0	1	1	B	1	1	2-1	1	+1, −2, +10
Stain from bed sheet from defendant's room	0	1	1	B	1	1	2-1	1	−1, −2, +10

is limited. Liquid blood samples from the parties involved should be profiled first. The bloodstain evidence should be frozen in the interim. The genetic markers that vary or discriminate the individuals involved should be given the highest priority for typing. The remaining bloodstain evidence should be typed in genetic markers that are most stable as well as those with the greatest population differentiation.

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