CASE REPORT

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Deduction of the Order of Sexual Assaults by DNA Analysis of Two Condoms

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ABSTRACT: Differential DNA extraction procedures were performed on two condoms found at a rape scene. One of the condoms was recovered intact (A), while the second condom (B) had apparently ruptured during the alleged attack. Two related suspects (cousins 1 & 2) were identified as the potential semen donors. Condom B contained DNA from the female and from one of the suspects. Condom A contained DNA from the suspect identified on condom B and from an unidentified individual. The presence of DNA from suspect 2 on both condoms led to the deduction that his sexual activity preceded that of the unidentified suspect. The ability to determine such a sequence of events using DNA typing is unusual.

KEYWORDS: pathology and biology, condom, DNA, differential extraction, RFLP, spermatozoa

Case Report

A female attending a party at a ground floor apartment passed out on a bed. Her friends closed the bedroom door without locking it and returned to the party. Later the friends found the door locked when they tried unsuccessfully to get into the bedroom after they heard strange noises. They broke the lock and discovered the woman alive, partially clothed, and still unconscious on the bed. The previously closed window was open and two condoms were on the floor. Since this was not the way they left their friend or the room, the police were called. The police collected both used condoms off the floor and took the woman to a local hospital for a sexual assault examination.

The sexual assault examination evidence collection kit containing vaginal/cervical slides and swabs along with both condoms were submitted to the crime laboratory. Subsequently, two men (cousins) were arrested. Known blood samples form the woman and both suspects were submitted to the lab with a request for DNA typing.

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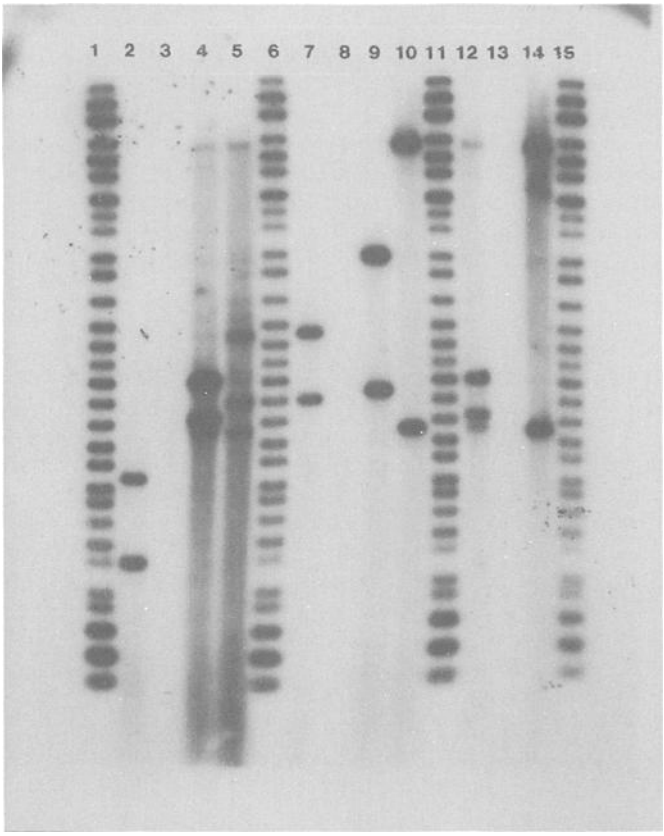

FIG. 1—*Autoradiograph of D10S28 hybridization showing the presence of different semen donors on the condoms from which event order can be determined. Lanes 1, 6, 11, 15—Gibco-BRL DNA Analysis Marker; 2-K562; 3, 8, 13—empty; 4- condom A E1; 5—condom B E1; 7—victim known; 9—suspect 1 known; 10—suspect 2 known; 12—condom A E2; 14—condom B E2.*

Lab Analysis

Examination of the sexual assault kit smears were negative for spermatozoa. Examination of smears from both condoms revealed spermatozoa. Condom B had a rupture/tear starting at the tip and extending back at a small angle for about 2 cm. Condom A was intact. There was no liquid in either condom. Also there were no trade marks, trade names, or numbers on either condom.

Both condoms were cut lengthwise to the tip. Each was placed in a separate sterile 50 mL screw top plastic tube. Sterile water (20 mL) was added to each tube and the tube securely capped. Each tube was shaken vigorously by hand for about 15 s. Each condom was removed and allowed to air dry prior to storage. The 20 mL extract was serofuged for 2 min at 1000 rpm. The supernatant was removed and saved. Using 1 mL of the saved supernatant the pellet was removed from the bottom of the 50 mL tube and transferred to a 1.5 mL microcap tube. The microcap tubes were microfuged for 2 min at 14X g. The supernatant was removed and combined with the original supernatant from the serofuge step.

The pellet was subjected to a routine differential DNA extraction protocol [*1,2*]. Pre-

restriction mini-gel electrophoresis showed the female fractions (E1) of both condoms yielded about 200 ng of intact HMW (high molecular weight) DNA. The male fraction (E2) of condom (A) yielded about 3 μg of HMW DNA. The male fraction (E2) of condom (B) yielded about 2 μg of HMW DNA. Following restriction with HAE III all knowns, unknowns, and control DNA samples were electrophoresed on 1% agarose in 1X TAE in the absence of ethidium bromide. Visualization of the DNA on the analytical gel was accomplished by staining with ethidium bromide after electrophoresis. The DNA was transferred to a positively charged nylon membrane [*3*]. The membrane was probed consecutively with MS1(D1S7), YNH24(D2S44), TBQ7(D10S28), pH30(D4S139) and V1(D17S79).

Results

The ruptured condom (B) contained DNA from two individuals. The male fraction (E2) contained DNA that matched suspect 2 in all five probes using the Georgia Bureau of Investigation, DNA unit, RFLP match criteria [*4*]. The female fraction (E1) contained a DNA mixture of the victim and suspect 2. The female victim matched in all five probes.

The intact condom (A) contained DNA from two individuals. The male (E2) and female (E1) fractions both contained a DNA mixture from suspect 2 and an unknown donor. Suspect 2 was matched in four probes. The quantity of DNA from the unknown donor was greater than the DNA from suspect 2 in both the male and female fractions.

Suspect 1 was eliminated as the donor of any DNA. Even though the suspects are cousins no band sharing was observed with these five probes. By examining the DNA patterns we were able to deduce that suspect 2 was the first to penetrate the victim. His condom (B) picked up female cells and he deposited some of his semen through the rupture/tear in his condom into the vaginal tract of the female victim. An unknown suspect penetrated the victim after suspect 2. His intact condom (A) picked up semen from suspect 2 and retained his own semen.

References

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