SAKI
SEXUAL ASSAULT KIT INITIATIVE
Reform. Accountability. Justice.

RTI INTERNATIONAL

DNA Testing 101:
Sexual Assault Kits

Screening

Biological Fluid Screening: Use of physical methods, biochemical assays, or microscopy to detect, characterize, or identify biological fluids or tissues. In sexual assault cases, biological fluid screening can be helpful in identifying semen, seminal fluid, spermatozoa, saliva, and blood.

Male DNA Screening: Use of a quantification assay that detects human and male DNA to screen cases using a step already present in the DNA workflow. This method can determine if enough male DNA is present to proceed with short tandem repeat (STR) testing, Y-STR testing, or both.

Testing

STR Testing: Commonly used nuclear forensic DNA test that targets areas in the DNA that are short, tandem, and repeated. It is the difference in the number of repeats at each location that differ among individuals; this information is compiled to create a DNA profile.

Y-STR Testing: Targets STR regions only on the Y-chromosome found in males. This test generates a Y-STR profile. Y-STR testing can be useful in cases with high levels of female DNA, male-to-male mixtures, and when a known male sample is available for comparison.

Workflow

Crime analysts complete the following steps to test biological evidence from a victim's sexual assault kit (SAK).

1. Swab from a SAK is cut and placed in a test tube.

2. Chemicals are added to remove cellular material from the swab and purify the DNA. In a differential extraction, two fractions are created when possible sperm cells are separated from non-sperm cells.

3. The amounts of human and male DNA in a sample are determined by quantification. This may be used as a screening step to determine if the sample continues with DNA analysis or not.

4. Based on the quantification results, the specific STR regions being examined are amplified to yield many copies of those regions during a process known as polymerase chain reaction. This amplification yields larger amounts of DNA, which in turn means more accurate and reliable results for later techniques.

5. DNA fragments are separated by size via applying a voltage to each sample during capillary electrophoresis. As DNA passes through a detection window, it is excited by a laser beam and visualized.

6. Computerized data acquisition helps analyze results and generate a DNA profile of the STR regions examined.

Reporting

DNA Testing Results

- **No further testing:** Insufficient biological fluid or male DNA exists to warrant DNA testing.
- **No results:** Insufficient biological material exists to generate DNA profile.
- **Partial profile:** Genetic information was obtained from some of the STR regions tested.
- **Full profile:** Genetic information was obtained from all STR regions tested.
- **Mixture profile:** Sample contains DNA from more than one contributor.
- **CODIS eligible:** DNA profile meets the quality requirements for entry and search in CODIS.

A hit occurs when a DNA profile matches another profile in CODIS.

CODIS: The Combined DNA Index System, or CODIS, blends forensic science and computer technology into a tool for linking violent crimes. It enables federal, state, and local forensic laboratories to exchange and compare DNA profiles electronically, thereby linking serial violent crimes to each other and to known offenders. (Definition taken from the FBI's Combined DNA Index System website.)

Offender Hit: Known DNA profiles from individuals associated with arrestee or offender profiles match against a profile entered from a crime scene, identifying a possible perpetrator.

Forensic Hit: Foreign DNA profiles from two or more crime scenes are matched together, but the source of the DNA profile remains unknown.

This project was supported by Grant No. 2015-AK-BX-K021 awarded by the Bureau of Justice Assistance. The Bureau of Justice Assistance is a component of the U.S. Department of Justice's Office of Justice Programs, which also includes the Bureau of Justice Statistics, the National Institute of Justice, the Office of Juvenile Justice and Delinquency Prevention, the Office for Victims of Crime, and the SMART Office. Points of view or opinions in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.