DNA Testing 101

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. Individuals can differ in the number of repeats tested at each location. The totality of repeat results at each location 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 a known male sample is available for comparison.
Workflow

Crime analysts complete the following steps to test biological evidence:

1. Evidence swab is cut and placed in a tube.
2. Chemicals are added to remove cellular material from the swab and purify the DNA.
3. The amounts of human 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 merit DNA testing.

- **No Results**
  Insufficient biological material exists to generate a 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**
  Data contains DNA from more than one contributor.

- **CODIS Eligible**
  DNA profile meets the quality requirements for entry and search in the Combined DNA Index System (CODIS).
**CODIS**

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

- **Offender Hit**
  Known DNA profile from an individual associated with an arrestee or offender profile matches against a profile entered from a crime scene, identifying a possible perpetrator.

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

- **More Information**
  Additional details can be found on the Bureau of Justice Assistance’s National Sexual Assault Kit Initiative (SAKI) website, [www.sakitta.org/](http://www.sakitta.org/).

**Webinars**

- **Foundations in Forensic DNA Testing for Sexual Assault Kits**
- **Use of Y-STR Testing for Cold Cases/Sexual Assaults**

**Author**

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