



End Violence Against Women International
(EVAWI)

Role of DNA Evidence in Sexual Assault Investigations

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September 2016
Updated September 2021

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Recommended Citation

Lonsway, K. A., Archambault, J., O'Donnell, P., Ware, L. (2021). *Role of DNA Evidence in Sexual Assault Investigations. Part 1: The ABC's of DNA Evidence*. End Violence Against Women International.



Authors

Dr. Kimberly A. Lonsway earned her PhD in the Department of Psychology at the University of Illinois, Urbana-Champaign. Her research career has focused on sexual violence and the criminal justice and community response systems, and she has written one book and over 100 training modules, bulletins, research articles, book chapters, and government reports on related topics. She has also trained thousands of professionals around the world, testified as an expert witness in criminal and civil court cases, and volunteered for over 15 years as a victim advocate. In 2012, she was awarded the first-ever Volunteer of the Decade Award from the Sexual Assault Recovery and Prevention (SARP) Center in San Luis Obispo, California. In 2003, Dr. Lonsway was invited to serve as a Founding Director for End Violence Against Women International (EVAWI), a fledgling nonprofit dedicated to improving criminal justice responses to sexual assault and other forms of gender-based violence. In 2004, she assumed the role as Director of Research, and she has since helped grow EVAWI into the premiere criminal justice training organization on sexual assault investigations, providing superior training and resources, influencing national policy, and mentoring a new generation of leaders.



Sgt. Joanne Archambault (Retired, San Diego Police Department) is the Founder and Chief Executive Officer for End Violence Against Women International (EVAWI). Prior to founding EVAWI, Sgt. Archambault worked for the San Diego Police Department for over 22 years, in a wide variety of assignments. During the last 10 years of her service, she supervised the Sex Crimes Unit, which investigated approximately 1,000 felony sexual assaults each year. Under her leadership, the San Diego Police Department's Sex Crimes Unit was recognized for pioneering research, groundbreaking victim-centered practices, and multidisciplinary collaboration that changed law enforcement responses to sexual assault across the nation. She also established and operated a highly successful for-profit training and consulting business for 22 years, providing expert guidance to hundreds of police departments and allied agencies, and training tens of thousands of practitioners.



In 2003, Sgt. Archambault founded EVAWI, a nonprofit organization dedicated to improving criminal justice responses to sexual assault and other forms of gender-based violence. Starting from scratch, she has grown EVAWI into the premier training organization on sexual assault investigations, providing superior training and resources, influencing national policy, and mentoring a new generation of leaders. In 2011, she achieved a dream first envisioned while working in the San Diego Police Department's Child Abuse Unit in 1985 – the launch of Start by Believing, a public awareness campaign designed to transform the way society responds to victims of sexual violence. With campaigns in all 50 US states, several US territories and protectorates, and numerous countries, this vision is now becoming a reality, changing the world for victims, one response at a time.

Dr. Patrick O'Donnell received his Bachelor of Science degree in biology from Santa Clara University in 1982 and his doctoral degree in molecular biology jointly from the University of California, San Diego and San Diego State University in 1988. In November of 1990, he was hired by the San Diego Police Department (SDPD) to design and build a DNA laboratory for the agency. Over 25 years, the SDPD Forensic Biology (DNA) Unit has established a progressive reputation with the latest focus being the implementation of GlobalFiler, using software expert systems to aid in the interpretation of complex DNA mixtures. As of September 2015, the laboratory has a staff of 18 and serves a population of 1.5 million people living within the city limits of San Diego.



Lauren Ware is the Chief of the Forensics and Special Investigative Branch at the Federal Law Enforcement Training Center (FLETC) in Glynco, Georgia. In this position, Ms. Ware leads a staff of 16 forensic instructors who are responsible for researching, designing and delivering the most current, relevant, and accurate forensics and specialized investigative techniques available to federal law enforcement officers. Prior to this, Ms. Ware spent ten years as a special agent with the Air Force Office of Special Investigations (AFOSI) and continues to serve in a reserve capacity. Her formal education includes a bachelor's degree in Physical Anthropology awarded from the University of Hawaii, and a master's degree in Forensic Sciences, with a concentration in crime scene investigation, from George Washington University.



This training bulletin is drawn from the Online Training Institute (OLTI) module entitled: [Laboratory Analysis of Biological Evidence and the Role of DNA in Sexual Assault Investigations](#). This comprehensive module explores the complex role of DNA in a sexual assault investigation, including the alternative sources of DNA evidence and their potential significance or impact on a sexual assault investigation. A number of resources and tools are provided, along with a series of complex and interactive case examples. The module is so full of useful information and tools that we want to give you a taste of what you will find in it. We hope this encourages you to go to the OLTI and register for the entire module. However, in this training bulletin, we explain some basic information about DNA and its role in a sexual assault investigation.

What is DNA?

DNA (deoxyribonucleic acid) is a molecule found in cells throughout the body that carries our genetic information. DNA can therefore be used to identify (or “fingerprint”) a specific individual, and this can then be used to support a successful investigation and prosecution of a suspect, exclude a suspect, or exonerate an innocent person.

The power of DNA fingerprinting stems from two primary factors. First, there are a large number of genetic markers, because DNA testing identifies characteristics at many different locations on the DNA strand. There are also enormous variations from person to person within these regions, so DNA typing can link evidence to a specific individual with an astonishing level of statistical certainty (except in the case of identical twins).

What are Sources of DNA for Forensic Purposes?

During the course of a sexual assault investigation, DNA and other biological evidence can be collected during the forensic examination of a victim or suspect – or from other evidence, such as objects found at the crime scene(s). The following are the sources from which DNA evidence is most commonly recovered in sexual assault cases:

- **Semen** may be left by a male suspect, either in or on a victim’s body (whether male or female), on clothing, or on other objects recovered from the crime scene. This is the most common source of DNA evidence in a sexual assault case.
- **Saliva** is the second most common source of DNA evidence, and it may be the result of kissing, licking, biting, or sucking, as well as oral copulation by either party. Saliva can also be left on objects, such as cigarette butts, cups, soda cans, and partially eaten food found at crime scenes.
- **Blood** may also be significant in a sexual assault investigation, and again, it may be found on the body or clothing of the victim and/or the suspect, or on objects recovered from the crime scene. Blood can also be transferred from a menstruating female to a male or female, or it can be the result of injury, which may corroborate the nonconsensual nature of a sexual act.

- **Fingernail scrapings or swabbings, as well as swabbings of the fingers** can potentially be collected from the victim and/or suspect in a sexual assault case and may yield evidence in cases of forced digital penetration. This may be of particular interest when there is information that the suspect or victim scratched the other party, or if the fingers of either person entered the other party's mouth, nose, or eyes. DNA from a person's sweat may even be recovered by collecting fingernail scrapings or finger swabbings, if the technology is sensitive enough.
- **Urine and fecal material** contain cellular material from an individual that may be used to develop a full or partial DNA profile. The source of the DNA is in cells shed from the body during the process of urination or defecation, not in the urine or feces themselves.
- **Other types of biological evidence** include bodily fluids that are rich in cells, such as sweat or vaginal secretions. DNA can also be recovered from other bodily tissues and fluids (including mucus, ear wax, dandruff, etc.).

Although hair from the head and pubic area are still collected as part of the examination procedure in some jurisdictions, they are rarely analyzed in sexual assault cases because laboratory findings are often inconclusive and DNA is much more powerful.

What are the Timeframes for Evidence Collection?

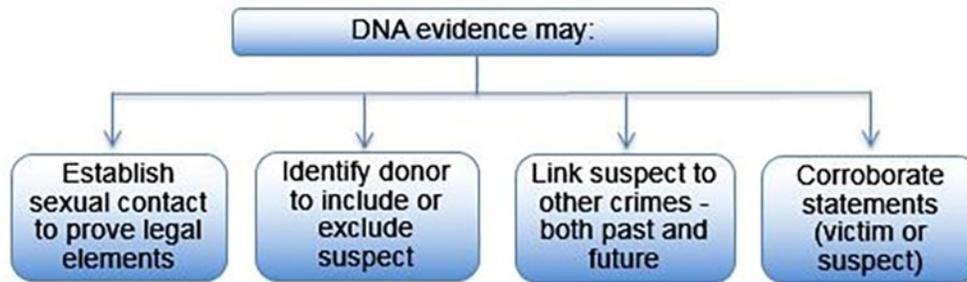
The forensic examination of a victim or suspect will only yield usable biological evidence for a certain period of time following a sexual assault. This is why many jurisdictions have timeframes for when they will conduct a medical forensic examination of the victim. These are usually in the range of 72–120 hours following a sexual assault.

Many communities follow the guideline of 120 hours (five days), which was recommended in the 2013 edition of the [National Protocol for Sexual Assault Medical Forensic Examinations](#). However, some jurisdictions are now extending that timeframe to 168 hours (seven days) or more, based on advances in DNA technology. In Illinois, for example, the seven-day guideline was established in [statewide regulations](#) designed to guide implementation of the Sexual Assault Survivors Emergency Treatment Act. A seven-day guideline is also currently being used in several cities in California.

As DNA technology continues to advance, this timeline may extend even further. However, it is always important to see these timeframes as guidelines rather than hard and fast rules, because medical forensic examinations may be of value beyond recommended timelines, for example if the victim complains of pain or has injuries.

What are the Primary Purposes of DNA Evidence?

Biological material may be used for a variety of purposes during the course of a sexual assault investigation. This is important to keep in mind, because the same evidence may be used for different purposes depending on the history of the assault and specific case facts.



Establish Sexual Contact

First, biological evidence may help to establish that a sexual act occurred. Establishing that sexual contact took place, or a particular sexual act was committed, may be critical not only for the investigation and prosecution of sexual assault, but also for sentencing purposes. However, it is crucial to note that the absence of biological evidence does not necessarily mean that a particular sexual act did not occur. There are many reasons why biological evidence may not be available in a sexual assault case, including the fact that no medical forensic examination was conducted, too much time elapsed between the assault and the medical forensic examination, or the suspect wore a condom.

Identify or Exclude a Suspect

If the suspect is unknown, a DNA profile may be developed from evidence collected during the course of the investigation, and then uploaded into the national DNA database known as CODIS (Combined DNA Index System). The DNA profile can then be compared with others in the database, in an effort to identify who the suspect is.

If the identity of the suspect (or suspects) is known, investigators can compare legally obtained DNA reference samples with DNA recovered during the investigation. This can potentially match the individual(s) with biological evidence associated with the assault.

This means that DNA reference standards should be collected from suspects whenever possible, and forensic profiles should be submitted to CODIS after the DNA from any consensual partner has been excluded. Of course, excluding suspects is another key use of DNA evidence, and it can also exonerate wrongfully convicted individuals.

Identify Prior Convictions or Arrests

If a suspect has prior convictions or arrests that are revealed by a CODIS hit, this information may be introduced during the prosecution of a sexual assault case. However, this is only true if the prior cases were substantially similar to the current one, demonstrating a pattern of past criminal behavior. Otherwise, this information may only be presented at the sentencing phase of the trial and not for a verdict.

Link Cases Based on Evidence

Another purpose of DNA evidence is to link cases with evidence submitted in any past cases – not just for sexual assault, but for any criminal offense included in the local, state, or national database. In Cleveland, for example, almost 4,000 evidence kits were tested between 2010 and 2015. As of September 2015, this process yielded 350 grand jury indictments and 100 convictions, many of which were for multiple sexual assaults. What has surprised officials most, however, has been the number of sexual assaults committed by serial perpetrators. This was reported in media coverage at the time:

One stunning finding that emerged from Cleveland's investigations is that as many as a third of reported rapes were perpetrated by a serial offender, a much higher proportion than officials anticipated. 'I've been in this business for 43 years and I thought I knew I something about it,' says [Timothy McGinty, the Cuyahoga County prosecutor] who guessed about 15% would be attributable to serial offenders. 'I was astonished' (Gourarie, 2015).

Recommendations for Best Practice

Unfortunately, many investigators and prosecutors only see DNA evidence as useful in stranger sexual assault cases, as a means of establishing or confirming the suspect's identity. This perspective fails to recognize the many purposes of DNA described here, especially in the majority of sexual assault cases where the victim and suspect know each other. Our recommendation is therefore to expand the use of DNA *regardless of whether the victim and suspect know each other – and even when the defense is likely to be consent.*

Another change is needed for investigators and prosecutors to stop viewing DNA as a means of confirming what they already know – and appreciate its value for advancing an investigation by producing leads and corroboration, as well as identifying and excluding suspects. All too often, DNA evidence is only tested when a case is headed to court – or when a suspect has already been identified and referred for prosecution. This needs to change. The benefits of this approach were described by a Los Angeles detective, after that jurisdiction enacted a policy of testing all sexual assault kits:

Having the DNA from every rape kit I book has given me investigative leads I never would have expected. I take second looks at cases I would have dismissed, and I pass along more cases to the prosecutors. I used to think I didn't need DNA to develop a case, but it has helped me solve more cases (Human Rights Watch, 2009, p. 18).

Other Sources of Biological Evidence

As described above, biological evidence can be found a variety of places, such as clothing, carpet, and furniture. Some other possibilities include suspect examinations and touch DNA. Now we will turn to reviewing those sources.

Suspect Examinations

In addition to a medical forensic examination of the *victim*, a forensic examination should also be conducted *with the suspect*, whenever this is warranted. In some jurisdictions, forensic examinations are routinely conducted with suspects who are arrested within a few days of the assault. *What is the situation in your community?*

For law enforcement personnel, does your agency have a protocol in place for suspect examinations? Or, even if there is no specific policy, are you able to obtain a forensic examination of a suspect who is arrested within days of the sexual assault? If so, who collects evidence from the suspect? Is it an officer, a specialized forensic examiner, a criminalist, or a crime scene technician?

For other community professionals, are you aware of the policies and practices of the law enforcement agencies in your area regarding suspect examinations?

To learn more about this topic and apply it to your jurisdiction, please see our online Training Bulletin on [Forensic Exams for the Sexual Assault Suspect](#).

Touch DNA

When it comes to the sources of DNA evidence, the fastest growing segment is referred to as “touch DNA.” Touch DNA encompasses scenarios where a person comes into contact with another person or object for a period of time, thus leaving some biological material behind. Touch DNA is often enormously important in the analysis of guns, knives, tools, and other implements used in property crimes.

With the advent of touch DNA, the possibilities for recovering biological evidence appear to be limitless. For example, DNA profiles are now being recovered from sources such as handguns, spent bullet casings, cell phones, tools, flashlights, steering wheels, and gear shifters – even paper documents like a demand note from a bank robbery. Touch DNA can also be recovered in some cases from articles of clothing (e.g., headband of a hat, the waistband of underwear, bra clips, or buttons on pants).

The ability to develop a profile from touch DNA is affected by three critical components:

1. The length of time the subject was in contact with the object.
2. The amount of force applied when touching the object.
3. The number of other individuals who potentially touched the object.

To illustrate these principles, an example can be drawn from a field that is very different from sexual assault. Due to the escalating price of copper, it is quite common for newly constructed housing projects to have copper pipe stolen and sold to recyclers. In some instances, the perpetrators have left their cutting tools behind. These tools have been used with a significant amount of force, with repeated contact by the perpetrators. As a

result, DNA testing of swabs collected from these items can often provide DNA profiles of a very high quality, although mixtures can sometimes be present.

On the other hand, laboratories are sometimes asked to test objects that have only been touched briefly by the perpetrator, such as a desk lamp that might have been moved by someone entering a home through a window. This type of momentary contact is unlikely to yield significant DNA, and success rates are therefore very low. Anecdotal evidence also suggests that low success rates have been seen in cases involving physical contact like groping, because the contact between victim and perpetrator is brief, and it often covers a relatively large surface area of the victim's clothing or skin.

The other factor affecting the ability to obtain a DNA profile using touch DNA is the number of individuals who might have come into contact with the person or object over time. With a gun or tool, there may be a limited number of individuals; however, with many other surfaces the potential number of contributors can be significant.

For example, laboratories are often asked to perform DNA analysis on door handles in burglary cases, or convenience store counters in robbery cases. In both of these scenarios, hundreds of people may have come into contact with the surface, each contributing a very small amount of DNA. In these cases, DNA testing is not likely to yield probative information, so the question will be whether any other investigative information is available. If there is no other meaningful information, but the crime is a very serious concern for the community (perhaps because of the threat of possible escalation), the laboratory might agree to conduct the analysis despite the limited chance of success. This is likely to be negotiated between investigators who are desperate for information and laboratory personnel considering the available resources.

Pregnancy and Paternity Testing

Before we conclude this discussion of the possible sources of DNA, it is important to note that a pregnancy resulting from a sexual assault can also yield critical biological evidence. Because 50% of a person's DNA is contributed by the mother, and 50% is contributed by the father, pregnancy can both establish the act of penile–vaginal penetration and identify the suspect at the same time. This evidence can then be used to pursue criminal charges, or to exclude a suspect if his DNA profile is excluded. This can be especially helpful in cases where a consent defense is not available; for example, in cases where the sexual assault offense is based on the victim's incapacity to consent due to age, severe disability, or relationship between the parties (i.e., incest). Evidence of pregnancy can also be important in sexual assault cases where the suspect has denied sexual contact or penetration, because it establishes the act with certainty.

In addition, DNA testing can be conducted on infants after birth or on aborted fetal tissue. In the case of a live child, reference samples can be collected from the child, the mother, and the suspected father. All three samples will then be submitted to a laboratory for analysis, so the mother's contribution to the child's DNA can be isolated. This allows the remaining portion of the DNA to be compared with the reference sample

collected from the suspected father. Given the power of current DNA analysis, such testing leaves little doubt as to whether a suspect is in fact the father of the child.

Analysis of aborted fetal tissue involves distinguishing biological material belonging to the aborted fetus from material contributed by the mother. Depending on the age of the pregnancy, separating aborted fetal tissue from maternal tissue can be challenging, and the laboratory may need the assistance of an embryologist to accomplish this. Once fetal material is isolated, the DNA testing process occurs much in the same manner as described for a baby that comes to term.

Because investigators will not typically handle a large number of cases involving fetal tissue, [instructions on how to collect this material](#) can be very helpful. We provide these sample instructions from the San Diego Police Department Sex Crimes Unit, but investigators should determine which laboratory they will use for any such analysis and follow any specific instructions the laboratory might provide.

Where to Look for Biological Evidence

The identification of biological evidence can be a critical step in a successful sexual assault investigation and criminal prosecution. Specialized training is therefore needed to ensure that key evidentiary items are properly identified and collected for laboratory analysis, and that they are appropriately documented, packaged, stored, and protected from potential contamination.

The following table is intended to provide general guidance on the possible sources of biological evidence and the likely location on the item where biological evidence might be found. It is drawn from the [Biological Evidence Preservation Handbook: Best Practices for Evidence Handlers](#), which was published by the National Institute of Standards and Technology and the National Institute of Justice (2013). However, the ultimate determination of whether and where a particular item might contain biological evidence will need to be made by investigators with knowledge of the specific case.

Evidence	Likely Location of DNA on the Evidence	Source of DNA
Baseball bat or similar weapon	Handle, end	Sweat, skin, blood, tissue
Hat, bandanna, mask	Inside	Sweat, hair, dandruff
Eyeglasses	Nose or earpiece, lens	Sweat, skin

Evidence	Likely Location of DNA on the Evidence	Source of DNA
Facial tissue, cotton swab	Surface area	Mucus, blood, sweat, semen, ear wax
Dirty laundry	Surface area	Blood, sweat, semen
Toothpick	Tip	Saliva
Used cigarette	Cigarette butt	Saliva
Stamp or envelope	Licked area	Saliva
Tape or ligature	Inside/outside surface	Saliva, skin
Bottle, can, glass	Side, mouthpiece	Saliva, sweat
Used condom	Inside/outside surface	Semen, vaginal or rectal cells
Blanket, pillow, sheet	Surface area	Sweat, hair, semen, urine, saliva
“Through and through” bullet	Outside surface	Blood, tissue
Bite mark	Person’s skin or clothing	Saliva
Fingernail, partial fingernail	Scrapings	Blood, sweat, tissue

Source: [Biological Evidence Preservation Handbook: Best Practices for Evidence Handlers](#), National Institute of Standards and Technology and the National Institute of Justice (2013).

When in Doubt, Collect It

Even if all of the items collected from a crime scene will not be examined by the laboratory, it is generally considered better to collect and store any evidence that might potentially be probative, rather than not to collect at all.

To offer an illustration, semen may be deposited on a bedsheet or bedroom carpet after a victim is sexually assaulted and forced to orally copulate a suspect. Some officers may not collect the sheet or carpet, based on the presumption that the victim’s mouth swab will contain the probative semen evidence needed to prosecute the case.

However, this is an optimistic view that is not always supported by case outcomes. Officers are often given only a single chance to collect such critical evidence and overlooking or ignoring it could lead to the suspect either destroying the evidence or cleaning it up after the opportunity for collection has passed. Fortunately, research indicates that DNA samples collected by patrol officers are as likely to yield high quality evidence as those collected by forensic technicians – at least in property crime cases (see National Institute of Justice, *Summary Findings of the DNA Field Experiment*).

For More Information

For more information on the use of DNA in sexual assault investigations, please register for the OnLine Training Institute module, [*Laboratory Analysis of Biological Evidence and the Role of DNA in Sexual Assault Investigations*](#).

References

Gourarie, C. (2015, September 2). [How an Ohio reporter helped convict more than 100 rapists](#). *Columbia Journalism Review*.

Human Rights Watch (2009). [*Testing Justice: The Rape Kit Backlog in Los Angeles City and County*](#). New York, NY: Human Rights Watch.

