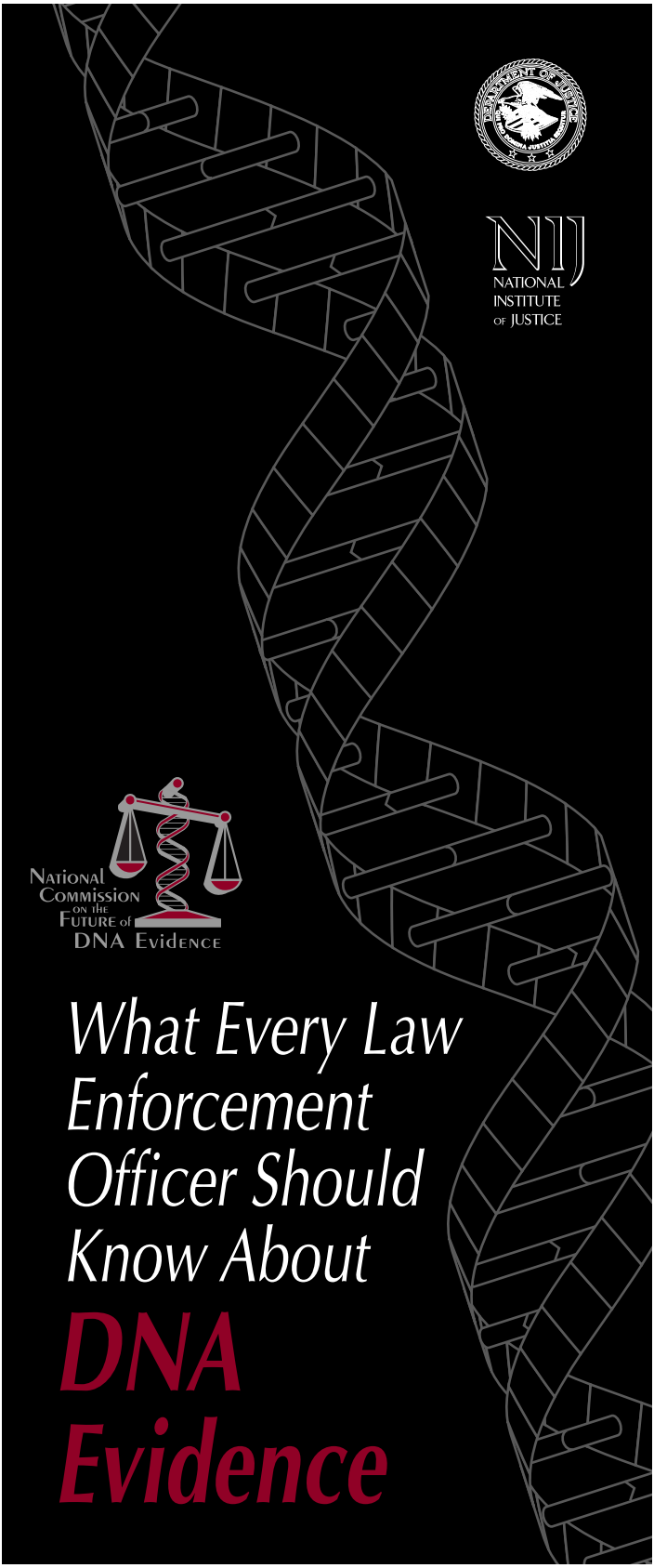


NIJ
NATIONAL INSTITUTE OF JUSTICE

National Commission on the Future of DNA Evidence

What Every Law Enforcement Officer Should Know About DNA Evidence

In 1996, Gerald Parker—then in a California prison on a parole violation stemming from a 1980 sentence for raping a child—was charged with the rapes and murders of five women between December 1978 and October 1979 and the murder of a fetus during a rape in 1980. DNA samples from the crime scenes were run through California's sexual assault/violent offenders database, and four of the cases were found to have been committed by the same perpetrator. After DNA tests linked Parker to the victims, he confessed to the crimes. He also confessed to a similar, fifth crime for which Kevin Lee Green had been wrongly convicted and had served 16 years in prison.

Just as today's law enforcement officer has learned to look routinely for fingerprints to identify the perpetrator of a crime, that same officer needs to think routinely about evidence that may contain DNA. Recent advancements in DNA technology are enabling law enforcement officers to solve cases previously thought to be unsolvable. Today, investigators with a fundamental knowledge of how to identify, preserve, and collect DNA evidence properly can solve cases in ways previously seen only on television. Evidence invisible to the naked eye can be the key to solving a residential burglary, sexual assault, or child's murder. It also can be the evidence that links different crime scenes to each other in a small town, within a single State, or even across the Nation. The saliva on the stamp of a stalker's threatening letter or the skin cells shed on a ligature of a strangled victim can be compared with a suspect's blood or saliva sample. Similarly, DNA collected from the perspiration on a baseball cap discarded by a rapist at one crime scene can be compared with DNA in the saliva swabbed from the bite mark on a different rape victim.

Where Is DNA Contained in the Human Body?

DNA is contained in blood, semen, skin cells, tissue, organs, muscle, brain cells, bone, teeth, hair, saliva, mucus, perspiration, fingernails, urine, feces, etc.

Similar to fingerprints

DNA is similar to fingerprint analysis in how matches are determined. When using either DNA or a fingerprint to identify a suspect, the evidence collected from the crime scene is compared with the "known" print. If enough of the identifying features are the same, the DNA or fingerprint is determined to be a match. If, however, even one feature of the DNA or fingerprint is different, it is determined not to have come from that suspect.

This brochure will explain DNA and the related identification, preservation, and collection issues that every law enforcement officer should know.

What Is DNA?

DNA, or deoxyribonucleic acid, is the fundamental building block for an individual's entire genetic makeup. It is a component of virtually every cell in the human body. Further, a person's DNA is the same in every cell. For example, the DNA in a man's blood is the same as the DNA in his skin cells, semen, and saliva.

DNA is a powerful tool because each person's DNA is different from every other individual's, except for identical twins. Because of that difference, DNA collected from a crime scene can either link a suspect to the evidence or eliminate a suspect, similar to the use of fingerprints. It also can identify a victim through DNA from relatives, even when no body can be found. And when evidence from one crime scene is compared with evidence from another, those crime scenes can be linked to the same perpetrator locally, statewide, and across the Nation.

Forensically valuable DNA can be found on evidence that is decades old. However, several factors can affect the DNA left at a crime scene, including environmental factors (e.g., heat, sunlight, moisture, bacteria, and mold). Therefore, not all DNA evidence will result in a usable DNA profile. Further, just like fingerprints, DNA testing cannot tell officers when the suspect was at the crime scene or for how long.

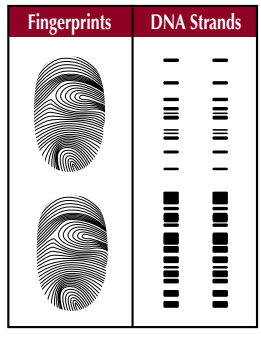
Where can DNA evidence be found at a crime scene?

DNA evidence can be collected from virtually anywhere. DNA has helped solve many cases when imaginative investigators collected evidence from nontraditional sources (see "Identifying DNA Evidence"). One murder was solved when the suspect's DNA, taken from saliva in a dental impression mold, matched the DNA swabbed from a bite mark on the victim. A masked rapist was convicted of forced oral copulation when his victim's DNA matched DNA swabbed from the suspect's penis 6 hours after the offense. Numerous cases have been solved by DNA analysis of saliva on cigarette butts, postage stamps, and the area around the mouth opening on ski masks. DNA analysis of a single hair (without the root) found deep in the victim's throat provided a critical piece of evidence used in a capital murder conviction.

Evidence Collection and Preservation

Investigators and laboratory personnel should work together to determine the most probative pieces of evidence and to establish priorities. Although this brochure is not intended as a manual for DNA evidence collection, every officer should be aware of important issues involved in the identification, collection, transportation, and storage of DNA evidence. These issues are as important for the first responding patrol officer as they are for the experienced detective and the crime scene specialist. Biological material may contain hazardous pathogens such as the human immunodeficiency virus (HIV) and the hepatitis B virus that can cause potentially lethal diseases. Given the sensitive nature of DNA evidence, officers should always contact their laboratory personnel or evidence collection technicians when collection questions arise.

Identifying DNA Evidence



Since only a few cells can be sufficient to obtain useful DNA information to help your case, the list below identifies some common items of evidence that you may need to collect, the possible location of the DNA on the evidence, and the biological source containing the cells. Remember that just because you cannot see a stain does not mean there are not enough cells for DNA typing. Further, DNA does more than just identify the source of the sample; it can place a known individual at a crime scene, in a home, or in a room where the suspect claimed not to have been. It can refute a claim of self-defense and put a weapon in the suspect's hand. It can change a story from an alibi to one of consent. The more officers know how to use DNA, the more powerful a tool it becomes.

Evidence	Possible Location of DNA on the Evidence	Source of DNA
baseball bat or similar weapon	handle, end	sweat, skin, blood, tissue
hat, bandanna, or mask	inside	sweat, hair, dandruff
eyeglasses	nose or ear pieces, lens	sweat, skin
facial tissue, cotton swab	surface area	mucus, blood, sweat, semen, ear wax
dirty laundry	surface area	blood, sweat, semen
toothpick	tips	saliva
used cigarette	cigarette butt	saliva
stamp or envelope	licked area	saliva
tape or ligature	inside/outside surface	skin, sweat
bottle, can, or glass	sides, 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

Contamination

Because extremely small samples of DNA can be used as evidence, greater attention to contamination issues is necessary when identifying, collecting, and preserving DNA evidence. DNA evidence can be contaminated when DNA from another source gets mixed with DNA relevant to the case. This can happen when someone sneezes or coughs over the evidence or touches his/her mouth, nose, or other part of the face and then touches the area that may contain the DNA to be tested. Because a new DNA technology called "PCR" replicates or copies DNA in the evidence sample, the introduction of contaminants or other unintended DNA to an evidence sample can be problematic. With such minute samples of DNA being copied, extra care must be taken to prevent contamination. If a sample of DNA is submitted for testing, the PCR process will copy whatever DNA is present in the sample; it cannot distinguish between a suspect's DNA and DNA from another source.

Transportation and storage

When transporting and storing evidence that may contain DNA, it is important to keep the evidence dry and at room temperature. Once the evidence has been secured in paper bags or envelopes, it should be sealed, labeled, and transported in a way that ensures proper identification of where it was found and proper chain of custody. Never place evidence that may contain DNA in plastic bags because plastic bags will retain damaging moisture. Direct sunlight and warmer conditions also may be harmful to DNA, so avoid keeping evidence in places that may get hot, such as a room or police car without air conditioning. For long-term storage issues, contact your local laboratory.

To avoid contamination of evidence that may contain DNA, always take the following precautions:

- Wear gloves. Change them often.
- Use disposable instruments or clean them thoroughly before and after handling each sample.
- Avoid touching the area where you believe DNA may exist.
- Avoid talking, sneezing, and coughing over evidence.
- Avoid touching your face, nose, and mouth when collecting and packaging evidence.
- Air-dry evidence thoroughly before packaging.
- Put evidence into new paper bags or envelopes, not into plastic bags. Do not use staples.

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Identifying **DNA Evidence**

Elimination samples

As with fingerprints, the effective use of DNA may require the collection and analysis of elimination samples. It often is necessary to use elimination samples to determine whether the evidence comes from the suspect or from someone else. An officer must think ahead to the time of trial and possible defenses while still at the crime scene. For example, in the case of a residential burglary where the suspect may have drunk a glass of water at the crime scene, an officer should identify appropriate people, such as household members, for future elimination sample testing. These samples may be needed for comparison with the saliva found on the glass to determine whether the saliva is valuable evidence. In homicide cases, be sure to collect the victim's DNA from the medical examiner at the autopsy, even if the body is badly decomposed. This may serve to identify an unknown victim or distinguish between the victim's DNA and other DNA found at the crime scene.

When investigating rape cases, it may be necessary to collect and analyze the DNA of the victim's recent consensual partners, if any, to eliminate them as potential contributors of DNA suspected to be from the perpetrator. If this is necessary, it is important to approach the victim with extreme sensitivity and provide a full explanation of why the request is being made. When possible, the help of a qualified victim advocate should be enlisted for assistance.

COmbined DNA Index System—CODIS

CODIS (COmbined DNA Index System), an electronic database of DNA profiles that can identify suspects, is similar to the AFIS (Automated Fingerprint Identification System) database. Every State in the Nation is in the process of implementing a DNA index of individuals convicted of certain crimes, such as rape, murder, and child abuse. Upon conviction and sample analysis, perpetrators' DNA profiles are entered into the DNA database. Just as fingerprints found at a crime scene can be run through AFIS in search of a suspect or link to another crime scene, DNA profiles from a crime scene can be entered into CODIS. Therefore, law enforcement officers have the ability to identify possible suspects when no prior suspect existed.

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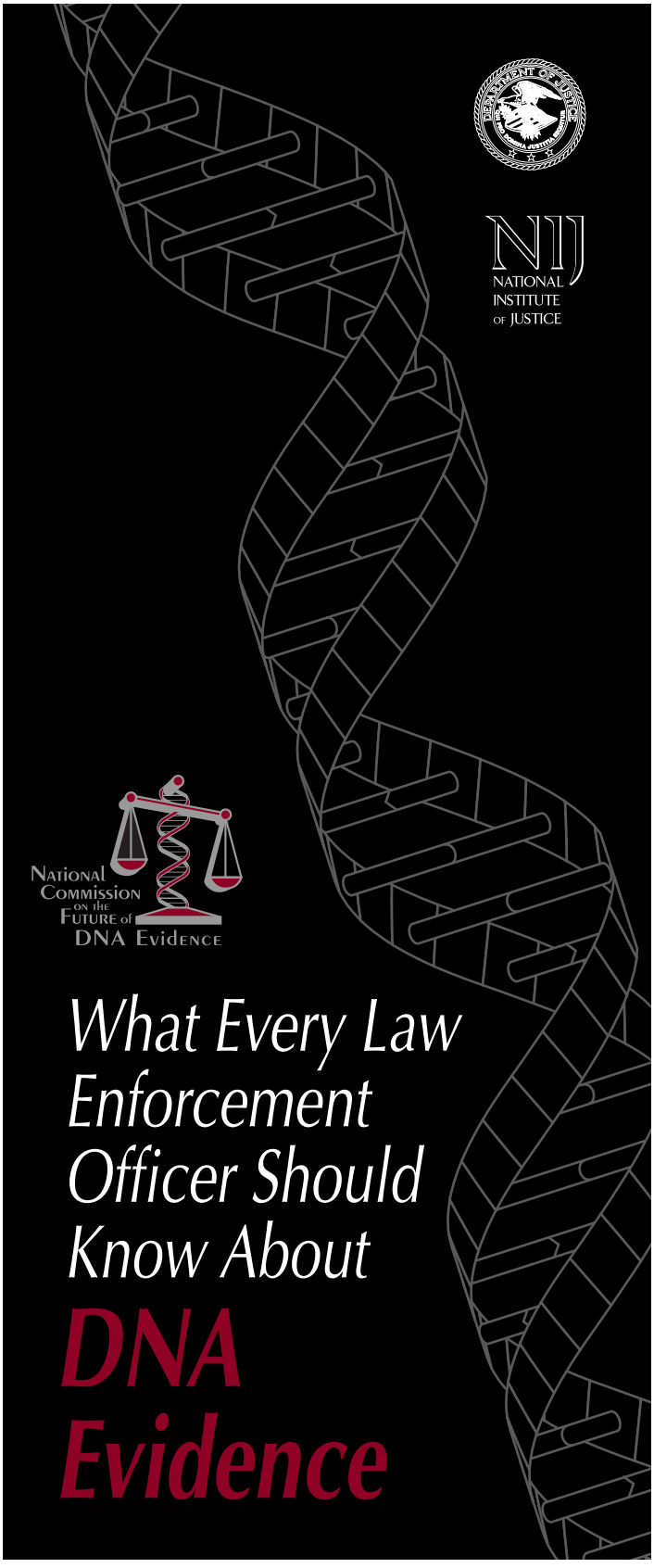

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