

# FORENSIC SCIENCE CENTER

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## Forensic Science Handbook *Seventeenth Edition*

*A Practical Guide to the Proper Packaging, Transport, and Submission of  
Evidence to the DuPage County Forensic Science Center*



**John E. Zaruba**  
**DuPage County Sheriff**  
**National Sheriff's Association President, 2009-2010**

# Forensic Science Center DuPage County, Illinois

*A Division of the DuPage County Sheriff's Office*

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**Honor \* Integrity \* Quality**

The DuPage County Forensic Science Center is accredited by the ANSI-ASQ National Accreditation Board to the ISO/IEC 17025:2005, the ASCLD/LAB-*International* Supplemental Requirements for Testing Laboratories:2011 and the FBI Quality Assurance Standards for Forensic Testing Laboratories:2011, certificate number: ALI-014-T.

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Some excerpts of this handbook were quoted or paraphrased from the FBI [Handbook of Forensic Services](https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view), which can be found at <https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view>

## Our Mission

The mission of the DuPage County Forensic Science Center is to support the criminal justice system with accurate, efficient, ethical, and professional scientific services that contribute to a higher quality of life for the citizens of DuPage County. This mission is achieved by meeting five main objectives:

- Maintaining proper facilities for casework and the receipt of evidence.
- Employing and training highly qualified scientists.
- Adhering to scientifically accepted procedures and laboratory quality assurance standards.
- Reporting analytical findings coherently and efficiently.
- Clearly articulating analytical findings in courts of law.

Scientists working within the center have access to state-of-the-art instrumentation, training opportunities, current literature, and a network of professional peers with which to exchange pertinent information. Collectively, these resources enhance the scientific reliability and accuracy of information reported by our laboratory.

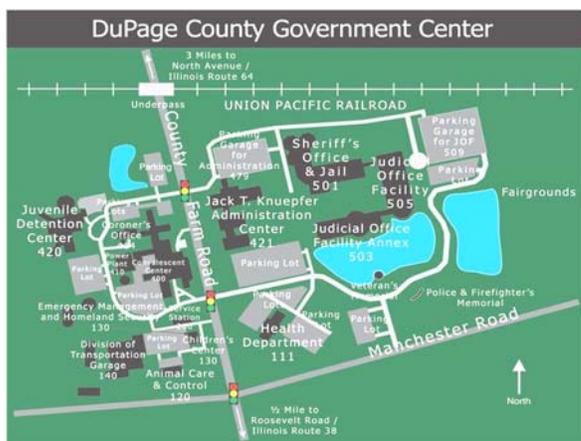
## What all Agencies Must Know

This handbook is an official communication put forth by the DuPage County Sheriff's Office for the benefit of all users of its forensic science services. Nonconformity to laboratory policies can result in evidence being returned to the submitting agency without analysis or the inclusion of language in a testing report or expert testimony that describes the nonconformity and its effect on evidence examinations.

It is critical that all participants in the DuPage County criminal justice system understand that the laboratory employs a complex quality-management system that includes carefully documented methods, scientifically validated procedures, and quality-control policies that are enforced for the benefit of your agency. They are in place to protect the integrity of the laboratory's work product and to prevent complications to ongoing investigations and court. Each agency that works with the laboratory is, in essence, a part of this quality-management system and will be asked to adhere to the guidelines and requirements set forth in this handbook.

## Directions

The laboratory is located at the DuPage County Government Center, situated on the east side of North County Farm Road approximately one half-mile north of Roosevelt Road (Route 38) in Wheaton. Located in the James "Pate" Philip Forensic Science Center, the laboratory is on the second floor of the 501 building. Follow signs to the Sheriff's Office / Jail and park at the west end of the 501 building.



### **Evidence Submission BY APPOINTMENT ONLY**

Monday through Friday

7:00 AM to 11:30 AM  
12:30 PM to 3:30 PM

**Please contact Mary at:**

(630) 407-2111

**OR**

[mary.dastych@dupagesheriff.org](mailto:mary.dastych@dupagesheriff.org)

# ***Contacting our Staff***

## ***Managing Scientists***

**Laboratory Director / Quality Manager**  
(630) 407-2101

**Drug Chemistry Technical Leader / Chemistry Supervisor**  
(630) 407-2103

**DNA & Forensic Biology Technical Leader / Supervisor**  
(630) 407-2051

**Latent Print Technical Leader**  
(630) 407-2110

**Trace Chemistry Technical Leader**  
(630) 407-2092

## ***Section Contacts***

***Chemistry Section***  
(630) 407-2099

***Forensic Biology/DNA Section***  
(630) 407-2104

***Criminalistics Section – Latent Prints***  
(630) 407-2112

## ***It's Your Forensic Science Laboratory***

Sheriff John Zaruba has taken a proactive approach to crime-fighting in DuPage County by investing resources that allow scientific technology and forensic expertise to aid law enforcement agencies in solving crimes. Since 1969, the citizens of DuPage County have benefited from the services provided by the laboratory, which are made available to all law enforcement agencies in the county. As a result, our criminal justice system is more efficient, more effective, and more prepared to fairly and objectively dispose of criminal matters brought before it.

In order to fully reap the benefits of these services, each agency within the DuPage County Criminal Justice System must work in partnership with their laboratory in the following ways:

- Have a full understanding of the laboratory's capabilities and limitations.
- Be specific when requesting services. The role of a forensic science laboratory is to answer questions. The more specific the questions are, the more specific our answers will often be.
- Submit evidence with ample case information such as a copy of an incident report, summary of the incident, or other narrative describing the crime scene, incident, and persons involved.
- Be familiar with your evidence and the case so that laboratory personnel can ask questions if necessary.
- Keep the laboratory posted of changes in case status. If a suspect pleads guilty to charges, or a case will no longer be adjudicated, contact the laboratory so that the evidence can be returned. This helps the laboratory minimize its case backlog, allowing cases to be worked in a timelier fashion.
- The laboratory evaluates all requests for testing to include a determination that the request is a reasonable use of resources.

In the interest of this on-going partnership, the laboratory offers a number of services to enhance professional awareness of its capabilities:

- The *Introduction to Crime Laboratory Services Seminar* for submitting agencies.
- The *Forensic Science Handbook* – a practical guide to the proper packaging, transport, and submission of evidence to the DuPage County Forensic Science Center.
- A website, [www.dupageforensics.org](http://www.dupageforensics.org) that allows 24-hour-a-day access to information about our laboratory.

Ultimately, efforts to enhance this partnership will pay dividends, helping to make DuPage County safer for our citizens and the police officers that work day and night to keep them safe.

## ***Understanding Testing Reports***

The laboratory reports its final results and conclusions in the form of a testing report, which is uniquely identified by the laboratory case number followed by a sequential digit. An example of a unique report identifier would be 18-0093-03 where:

- 18 is the year, 2018, in which the case was created.
- 0093 represents the ninety-third case accepted by the lab in 2018.
- 03 represents the third testing report issued for case number 18-0093.

The results communicated in a laboratory testing report contain observations, results, and conclusions rendered by a scientist who has the requisite training to conduct the analyses from which the reported information was generated or gathered. Laboratory staff are available to answer questions regarding reports, are available for pre-trial conferences for both prosecution and defense and will testify in court when needed.

## Complaints

The law enforcement community of DuPage County is strongly encouraged to voice any dissatisfaction with our forensic science services or personnel as soon as possible. Feedback forms are available at the submission desk. Complaints should be brought to the attention of the director by phone or in writing. If it is necessary to bypass the director, complaints may be forwarded to Sheriff John Zaruba at (630) 407-2001.

It is vitally important for any instances of substandard service to be reported in a timely fashion. Complaints are often the first step towards improving an organization's level of service.

To report a complaint to the laboratory director please call (630) 407-2101 or email the director at [claire.dragovich@dupagesheriff.org](mailto:claire.dragovich@dupagesheriff.org).

## General Submission Procedures

This section is intended to provide basic instructions for the submission of evidence to the laboratory. No set of instructions, however, can encompass every possible scenario that may arise. Common sense should always be exercised in the collection, preservation, and transport of evidence. Be sure to read the section titled "Special Considerations" for more information.

1. **Place evidence exhibits in appropriate containers.** Large and bulky items that do not lend themselves to packaging may be submitted without packaging if contamination, degradation, or evidence alteration is not an issue.
2. **Seal each container** with tamper-indicating tape.
3. **Handwrite your initials and the date** across the tape and onto the surface of the package.
4. **Mark each package** with the agency name, case number and a unique identifier if there are multiple packages for the same case number (e.g. Package 1 of 2, Package 2 of 2).
5. **Complete an Evidence Submission Form.** Sample forms are available to assist you in completing this form. OR, for agencies that utilize the BEAST evidence management software print a copy of the lab submission sheet.
6. **Complete a DNA Evidence Submission Form.** This form must accompany all forensic biology/DNA submissions. A copy of this form can be found at:  
<http://www.dupageforensics.org/documents/LAB-F%202015%20FBDNA%20Submission%20Form%20electronic.pdf>
7. **Write or include a summary of the incident or scene being investigated.** The length and detail of the summary should be commensurate with the complexity of the case.
8. **Transport your evidence and documentation to the lab.** You must schedule an appointment with Evidence Intake prior to transporting evidence to the laboratory.
9. **Testing Reports** will be mailed and/or given to submitting agency at their next evidence delivery. Reports are also available electronically to the DuPage County State's Attorney Office.

### ***Describing Your Evidence***

When listing evidence on the submission form, it is not necessary to give lengthy descriptions or describe secondary containers. The following is an example of how evidence should be listed on the submission form:

- “DNA buccal swab from Victim Jane Doe”
- “White powder (from John Doe)”
- “Fire debris from crime scene”

The purpose of an evidence submission form is to inventory what is in the package and (in some cases) from whom or where it was recovered.

### ***Laboratory Evidence Routing***

Forensic science laboratories process evidence in a specific order. The following is the routing policy of the laboratory:

*The sequence in which the laboratory processes evidence can have a significant impact on the integrity of the evidence. Evidence submissions with multiple service requests must be routed through the laboratory in the proper sequence. The following sequence will be followed unless case specifics dictate otherwise:*

1. Trace Analysis / Flammables & Combustibles
2. Forensic Biology
3. Latent Fingerprints
4. Controlled Substances
5. Firearms/Toolmarks (Service not currently available in-house)

*By virtue of their expertise, analysts will be expected to assess how and if a specific analysis may compromise the suitability of the evidence for analysis by subsequent disciplines. When such circumstances are present, the analysts from the corresponding sections of interest will confer and act accordingly.*

### ***Selecting Your Packages***

The packages or containers that are selected for evidence will often depend on the evidence itself. Evidence packages fall under two broad categories: *External Packaging* and *Secondary Packaging*. An external package is the outermost container upon which all of the necessary information will be written. A secondary package is one or more that is sealed inside of the external package. An evidence technician’s goal in selecting a suitable package for evidence is to protect the evidence from loss or damage and to allow for a proper seal as listed in the next section. In addition, the ability to utilize the original packaging for repackaging after analysis should be taken into consideration.

### ***Sealing Your Packages***

The purpose of a seal is to accomplish the following:

- Prevent loss of evidence
- Prevent cross-transfer of evidence or evidence samples
- Prevent deleterious change or degradation resulting from exposure to air or ambient conditions
- Render the package *tamper evident* making it impossible to access the interior of the package without causing obvious damage to it
- Identify the person who created the seal and the date it was sealed

If any of these objectives have not been met, then the seal is improper. A seal should be made with tamper-indicating tape when possible, with the officer’s initials, badge number, and date written across the tape and onto the package itself. Seals such as those found on envelopes, which are made by the manufacturer of the container, are considered sealed and need not be marked or over-sealed in any way.

It is vitally important that law enforcement officials be aware of how to properly package and seal their evidence for submission to the laboratory.

### ***Marking Your Packages***

There are many different kinds of evidence packages and containers. Some have pre-printed with fields to be filled out by the submitting agency. Not all packages, however, have such fields. At a minimum, the following information should be marked on the external package when submitted: *Agency Name, Agency Complaint Number and a unique identifier if multiple packages are submitted with the same Agency Complaint Number.*

Refer to forensic disciplines in the table of contents for more specific evidence packaging procedures.

## ***Major Case Reviews***

A major case review may be conducted to review collected evidence and potential evidence requests on cases requiring multidiscipline analysis and/or with large amounts of items for testing. The review typically includes laboratory staff, representatives from the investigating agency and representatives from the DuPage County State's Attorney Office. This process provides a means for all parties to discuss which evidence will be submitted to the lab, and helps to prioritize the items to be submitted for analysis.

To schedule a major case review contact Mary at 630.407.2111 or via email at [mary.dastych@dupagesheriff.org](mailto:mary.dastych@dupagesheriff.org).

## ***Controlled Substances***

### ***Description of the Science***

Utilizing microscopical, instrumental, chemical and other techniques, unknown substances in various forms including, but not limited to, plant material, powders, tablets/capsules, paper and liquids can be analyzed for the presence of controlled substances and cannabis as defined in the Illinois Controlled Substances Act. Illinois Compiled Statutes. §720 ILCS 570; and the Cannabis Control Act. Illinois Compiled Statutes. §720 ILCS 550.

### ***Special Considerations***

Submissions for controlled substance analyses come in a wide range of sample types and sizes. Packaging and submission procedures must be governed on a sample-by-sample basis. Evidence is tested for controlled substances which would reasonably be expected to be found in the form of the item submitted. Although a sample may contain a mixture, the laboratory reports the controlled substance with the highest schedule or the controlled substance which can be positively identified.

### ***Susceptibility to Contamination***

Possible sources of contamination include the unintentional introduction of a controlled substance by sample cross-contamination. This can result from careless handling or improper packaging.

### ***Safety Hazards***

Exposure to substances of unknown origin represents a significant health and safety hazard. This exposure may be through ingestion, respiration, or absorption through direct contact with the skin or mucous membranes.

### ***Submission Restrictions***

As part of the laboratory's ongoing management of its case volume, it is common for the laboratory to return evidence on cases that have been legally adjudicated. The purpose for such action is to clear our caseload so that our chemists can devote their time to cases being addressed by the criminal justice system.

The following submission policies apply to controlled substance cases:

1. The laboratory does not accept cases where there is no suspect.
2. Cannabis pipes will not be tested for drug paraphernalia charges unless accompanied by a request from the State's Attorney's Office.
3. Syringes, liquid from syringes and any part of a syringe (barrel, needle) will not be accepted.
4. The laboratory reserves the right to not perform testing on residues when the surface has been subjected to field testing by police personnel.
5. The laboratory will not conduct analysis of evidence in cases limited to violations of local ordinance (this includes suspected cannabis less than 10 grams).

### ***Proper Packaging and Submission***

The following guidelines should be adhered to whenever possible. If circumstances arise that cannot be addressed by this list, contact the laboratory immediately.

- Do not submit field test kits.
- Cannabis plants must be submitted in a dry state, packaged in paper or cardboard. If the plants are growing when found, remove the plants from their containers and remove as much dirt as possible, leaving the root system intact. A plant is not considered a plant unless the root system is attached. Allow the plant to air dry before packaging.
- Analysts are available to go on location to assist in the documenting and collection of samples from suspected cannabis plants. This service is provided for larger grow operations and is more efficient than submitting the entire plant. If you require this service, please contact the laboratory prior to packaging of the plants.
- Fresh mushrooms should be removed from their growing media and allowed to air dry, prior to being packaged in paper or cardboard.
- Liquid evidence should be submitted in a leak-proof container and should be kept refrigerated. If the original container leaks when tipped, transfer the contents to a new container (jar, vial, etc.).
- When liquids are submitted for controlled substance analysis, the entire amount must be submitted. Liquids are not accepted for alcohol analysis.
- Please note on the submission form if the case is a garbage pull and, if so, mark it as a biohazard. We will prioritize garbage pulls if they are being used to obtain a search warrant. Garbage pulls will not be accepted if a search warrant has been obtained or executed.
- Please note on the evidence and/or submission form, the location where each item was found and which suspect it will be attributed to. It is also important to note if there was an item that was the probable cause to search, etc.
- Advise the laboratory when submitting suspected PCP as the solvent may be flammable.
- If the evidence is from a controlled buy, please indicate if it was an informant buy (agency designation A, B, C etc.), or an agent controlled buy (agency designation 1, 2, 3 etc.).
- Testing of pharmaceutical tablets and capsules will be limited to the highest schedule.
- Electronic cigarettes should have their batteries removed prior to submission to the laboratory
- Biohazard stickers should be affixed to outer packaging when evidence may have come in contact with body fluids. Examples include evidence located in a toilet, found in a person's underwear.
- DO NOT use biohazard stickers to indicate the presence of toxic chemicals such as LSD, PCP, Fentanyl and other potent synthetic opioids. This should be indicated on the submission form.

## **Latent Prints**

*The laboratory has reestablished service in latent prints.*

### **Description of the Science**

Utilizing visual, photographic, and chemical processing techniques, the laboratory is able to compare the fingerprints of known individuals with latent fingerprints recovered from or developed at a crime scene. The basis for the science of fingerprint examination is that friction ridge patterns present on the human fingers, palms of the hands, and bottoms of the feet are both persistent and unique to an individual.

### **Submission Restrictions**

Lift cards may contain multiple latent prints; therefore, it is advised the laboratory is consulted prior to the submission of more than 10 lift cards.

### **Special Considerations**

Fingerprints are primarily made of water and therefore are inherently fragile. Care must be taken to protect them from accidental contact and from environmental conditions such as precipitation and extreme temperatures.

### **Elimination Prints**

The laboratory requires that elimination prints be compared to latent prints prior to all Automated Fingerprint Identification System (AFIS) searches. This conserves time and also better utilizes laboratory resources. In addition, the State of Illinois requires that elimination prints be compared to latent prints prior to any latent print being registered in the AFIS system for continued searching. Elimination prints are defined as **record prints of an individual who had legitimate access to a crime scene or who is known to have touched a particular item in question.** It is required that elimination fingerprints of all such individuals be submitted along with questioned evidence in any latent print cases in which AFIS searches are requested.

### **Susceptibility to Contamination**

Contamination is caused by the unintentional deposition of fingerprints on items to be examined, often by first responders or other law enforcement personnel. In order to prevent contamination, all questioned evidence for latent prints should be handled with gloves at all times.

### **Safety Hazards**

There are no specific safety hazards associated with this kind of evidence; however, it is recommended that universal precautions be taken.

### **Proper Packaging and Submission**

Latent print evidence should always be packaged in paper or cardboard. If possible, secure the item within the package to minimize movement and prevent the destruction of any latent prints.

### **Comments**

If photographs of latent prints are submitted to the laboratory for examination, they should be in RAW or TIFF format and must include a scale. If investigating agencies choose to process evidence prior to submission to the laboratory, the method of processing should be clearly indicated on the submission record. In addition, investigating agencies should be aware that any processing done prior the submission may affect the capability of the laboratory to process the item further. Agencies are encouraged to contact the laboratory with questions prior to processing any items for submission.

## **Firearms (Ballistics)**

*The laboratory does not currently have a qualified firearms analyst on-site. Please contact the laboratory to determine if out-sourcing of firearms evidence is available prior to submission of your evidence.*

### ***Description of the Science***

In its most basic form, firearm identification involves determining if a fired bullet or discharged cartridge case was or was not fired from a particular firearm. Such conclusions are possible due to the microscopic imperfections left in the barrel and other components of the firearm during the manufacturing process. The resulting pattern of striae and impressions imparted to bullets and cartridge cases are unique to the gun that fired them.

Firearms examination offers various types of analysis and conclusions that can be offered. The following examinations are performed on firearm evidence submitted to the laboratory:

- Microscopical Comparative Analysis – This is commonly referred to as “ballistics” or the identification of bullets and cartridge cases as being fired from a particular firearm.
- Determine Type of Weapon (DTW) – Whenever fired bullets or cartridge cases are submitted to the laboratory absent a suspect firearm, an examination (DTW) is performed to provide investigators with makes of firearms that may have fired the submitted evidence.
- Firearm Function Testing – This involves the examination of the gun for operability as well as the amount of force required to pull the trigger.
- Serial Number Restoration
- IBIS (Integrated Ballistics Identification System) Entry – Fired cartridge cases are entered into a computerized database, IBIS, and compared to fired evidence from prior crime scenes.

### ***Special Considerations***

The value of the results rendered by a firearm examiner is often affected by the location or person from which the examined evidence was recovered. Incident reports should always be submitted with firearm evidence recovered from a crime scene.

### ***Susceptibility to Contamination***

Firearm evidence is often durable and not susceptible to environmental or ambient contamination. Caution must be exercised, however, when removing bullets from walls or other structures. Toolmarks imparted to the bullet during extraction can destroy the unique markings used for comparison purposes.

### ***Safety Hazards***

Firearms pose a significant safety hazard and should be treated accordingly. The possibility for an accidental discharge warrants the exercise of extreme caution.

Firearm evidence often introduces a biological hazard, particularly in suicide cases or cases where bodily fluids are deposited on the firearm. Bullets that pass through bodies are a biological risk, and often have sharp jagged edges that can puncture the skin if handled carelessly.

Guns that are bloody or bear a potentially biohazard residue should be secured in a box with punch holes and then further wrapped in a paper bag. This will prevent biological material from “falling” out of the punch holes and contaminating surfaces coming in contact with packaged evidence.

### ***Proper Packaging and Submission***

Submitters must ensure that firearms are unloaded at the time of submission and that the barrel direction is indicated on the package. If a submitting agency suspects that a firearm might be loaded, the laboratory must be contacted prior to submission so that a qualified examiner is available to inspect the evidence at the time of submission.

Evidence bullets should be packaged individually in small cardboard boxes, envelopes, or film canisters. Bullets may be rinsed clean of bodily fluids to preserve the markings used for comparison; however, it is not recommended brushes or abrasive materials be used to remove substances from the surfaces of bullets as this may affect the integrity of toolmarks used during the comparison process.

Cartridge cases can all be packaged in a single container; however, multiple cartridge cases should be packaged according to their location at a scene and marked accordingly. This often aids reconstructing the crime scene, particularly when multiple shooters are involved.

Firearms recovered from a body of water should be packaged submerged in a container with water from where the firearm was located. This will prevent rapid rusting of the firearm.

#### **Comments**

Firearm evidence is often an extension of the crime scene itself. Proper documentation of the condition of a firearm (such as whether or not the hammer was cocked or safeties were engaged) should be recorded by on-site personnel as needed.

## **Flammables & Combustibles (Fire Debris)**

### **Description of the Science**

Utilizing the scientific principles of chemistry, the laboratory is able to identify the presence of ignitable liquids in submitted samples. Analytical data generated by our instrumentation is compared against known standards, allowing the forensic chemist to identify the class of flammable liquid present.

### **Special Considerations**

Samples must be submitted as soon as possible due to the volatility of flammable liquids. Long term storage of evidence cans containing clothing or fire debris evidence can result in chemical degradation of potential flammable or combustible liquid residues. Evidence cans may also corrode rapidly depending upon the corrosive nature of the fire debris present in the evidence can. This can lead to the production of holes in the evidence can. The laboratory should be advised of how much time has passed between sample collection and sample submission. Soil or dirt samples should be refrigerated or frozen to slow microbial degradation of flammable liquids. Whenever possible, submit an uncontaminated substrate control sample. This is also known as a comparison sample. Examples include soil/dirt, home furnishings such as draperies, and various construction materials such as molding, wood, floor tile, ceiling tile, roofing materials and carpeting/padding. This is also important with substrate materials used by the fire investigator to collect traces of flammable liquids such as a sponge or gauze pad.

### **Susceptibility to Contamination**

Possible sources of contamination include the unintentional introduction of flammable liquids by sample cross contamination. Never place latex or rubber gloves in containers with evidence sample. If you must retain the gloves with the evidence, tape them to the exterior of the evidence can. If the evidence has been repackaged from a plastic bag or other non-vapor tight packaging, make certain that this original packaging material is not placed into the evidence can along with the evidence.

If the presence of a particular type of ignitable liquid is suspected based upon a fire scene investigation, this information should be communicated on the laboratory evidence submission form.

When receiving a new shipment of metal paint cans, each submitting agency can voluntarily submit a new evidence can for quality control testing. Please contact the laboratory for further instructions.

### **Safety Hazards**

Exposure to substances of unknown origin represents a significant health and safety hazard. This exposure may be through ingestion, respiration, or absorption through direct contact with the skin or mucous membranes. Ignitable liquids represent an explosion hazard and should be treated accordingly.

### **Proper Packaging and Submission**

Submit fire debris evidence and clothing in unused paint cans to prevent loss of ignitable liquid evidence. The largest size can that can be accepted is a 5-gallon can. The use of paper bags or cardboard boxes is unacceptable. Evidence cans must not be filled all the way to the top. They should be filled no more than three quarters full, leaving an air space above the debris or clothing. Make certain that you provide

information regarding the type of evidence present in each evidence can and also provide the recovery location. This information along with standard chain of custody information can be provided directly on each evidence can.

Submitters must minimize potential hazards associated with ignitable liquids and prevent loss of evidence through the following:

- Submit liquid samples in a secure unused container having a secure top, such as a glass vial or jar. A glass vial with a Teflon lined screw cap is recommended. Do not submit liquid samples in bottles with rubber eye droppers.
- Submit no more than 2 milliliters (mL) of unknown liquid (in small vial) for analysis. Large cans containing possible flammable liquid must not be submitted.
- Be certain that the lid makes a strong seal around the entire can.

### **Comments**

Clothing and shoe evidence that is submitted to the laboratory for flammable / combustible liquid analysis must be packaged in a vapor-tight metal can in the same manner as fire debris evidence. Evidence cans are commercially available in many sizes.

## **Forensic Biology & DNA**

### **Description of the Science**

Forensic Biology (FB) searches for the presence of body fluids and trace evidence. FB currently provides presumptive tests for blood, semen, and saliva, and a confirmatory test for semen. In the case of contact with skin (see “contact DNA” below), the Forensic Biologist is limited to preparing the submitted item for a DNA analyst to test.

Deoxyribonucleic acid (DNA) is a chemical that provides the instructions for a person’s physical characteristics. A person is made of trillions of various kinds of cells. Each cell containing DNA has a complete and identical copy of DNA in its nucleus (i.e., nuclear DNA). DNA is also found in other places in the cell (for example, mitochondrial DNA). Taken as a whole, each person’s DNA is unique (with the exception of identical twins). Forensic DNA only examines a few portions of the DNA, but because these portions aren’t linked to each other, a specific combination of them can be highly discriminating. DNA collected from a crime scene can either link a person to the evidence or eliminate them as the source of DNA. DNA can also be used to show familial relationships. Using the DNA database (known as CODIS), DNA from crime scenes can be compared with the DNA of convicted offenders or with DNA left by the perpetrators at other crime scenes.

DNA results can be obtained from evidence that is decades old. However, several factors can affect the DNA left at a crime scene, including environmental factors (e.g., dilution, sunlight, and bacteria). Not all DNA evidence will result in useful DNA results, although results can usually be obtained when testing a visible stain. Generally, there needs to be several cell’s worth of DNA to obtain useful DNA results.

### **Special Considerations**

When transporting and storing evidence that may contain DNA it is important to keep the evidence dry, and at room temperature (or lower). Paper or other breathable packaging is preferable. However, if evidence that may contain DNA is stored in plastic bags, metal cans, Styrofoam, or glass, then it must be kept frozen without any thawing. Do not expose evidence to direct sunlight and avoid places that may get hot, such as a police car without air conditioning.

Agencies are reminded of the statutory requirements of the Illinois Sexual Assault Evidence Submission Act. Illinois Compiled Statutes. §725 ILCS 202 (2010.) Evidence submitted for analysis must include a certification that the evidence is submitted in connection with a criminal investigation and must be submitted to a laboratory within ten days of collection.

There are no submission restrictions based on a total loss dollar amount for the crime. Cases can be accepted for DNA analysis whether or not a suspect has been identified.

### ***Susceptibility to Contamination***

Due to the sensitivity of the tests used by our laboratory, extra care must be taken to prevent contamination. Evidence can be contaminated 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. It can even happen by leaning over the evidence because skin cells could be unknowingly deposited on its surface. The DNA testing process will copy whatever DNA is present in the sample; it cannot distinguish between the original DNA and DNA that was added later. However, the DNA tests are semi-quantitative, so if there is a preponderance of DNA from one person, the DNA from another person may not even be detectable. If a mixture is detected, it may be possible to attribute the portion of results attributed to a particular person.

### ***Safety Hazards***

Biological evidence samples and materials may contain hazardous pathogens. Universal precautions must be taken whenever blood or other body fluids are collected and submitted. All evidence that is thought to contain body fluids must be labeled with a biohazard label.

### ***Proper Packaging and Submission***

Investigators and laboratory personnel should work together to determine the most probative pieces of evidence and to establish priorities. The most useful information will be obtained when the analyst can:

- find blood or other body fluid with the victim's DNA profile on the suspect, something in the suspect's possession, or something associated with the suspect
- find blood or other body fluid with the suspect's DNA profile on the victim, something in the victim's possession, or something associated with the victim.

How to Collect Questioned Samples - When samples are small and easily transportable, such as a cigarette butt, they can be collected and packaged whole. In most instances, it is better for the crime scene investigator to collect the stain via swabs or cuttings. The method chosen will vary depending upon whether the surface upon which the stain has been deposited is absorbent or not. For an item that is absorbent, such as a carpet, the best collection method may be to cut out the stained portion. Non-porous surfaces, such as a glass window, are amenable to swabbing. Do not handle the stained area directly. Wear gloves when collecting stains.

To collect dried stains, use distilled water to moisten a swab made of cotton (preferable) and rub this across the stain. Make the stain as concentrated as possible on the swab, but be sure to collect the entire stain. Air-dry wet stains at room temperature before packaging. Do not fan or heat-dry stains. If multiple swabs of a single stain are collected, it is good practice to number the swabs in the order they were collected. A **control** sample is not necessary due to the sensitivity of DNA and the semi-quantitative nature of DNA results.

PLEASE DO NOT USE FLOQ SWABS. Due to the many different manufacturers of FLOQ swabs, the Forensic Biology & DNA Section no longer recommends the use of FLOQ swabs for the collection of evidence. These swabs make DNA extraction difficult in some situations and cannot be used for collection of a standard (see below).

How to Collect Known Samples - To collect a **standard** (a DNA sample witnessed to have come directly from a person, and used for the purposes of comparing to DNA results from evidence), blood or saliva (i.e., buccal) samples may be submitted. For buccal swabs, be sure to use a sterile cotton swab. Do not let the subject eat, drink, or place anything in their mouth, except for water, for approximately 15 minutes prior to collection. It may be helpful to have the subject rinse their mouth with water before collecting the sample. Rub the inside of either cheek a few times. It is not necessary or helpful to swab the subject's tongue, teeth, throat or lips, or to collect different areas of the mouth.

Standards from suspects should be collected whenever possible. Elimination standards from anyone not suspected to be the perpetrator, such as a victim, consensual sexual partner, family member who recently drove the stolen vehicle, must be submitted with the evidence for any individual who had legitimate access to the crime scene and may have deposited their DNA on the evidence.

Other Considerations - Items submitted for DNA analyses are categorized and prioritized as follows: (1) associative analysis, (2) corroborative analysis, and (3) crime recreation. Analyses will not be conducted for the sole purpose of crime recreation when a suspect has been identified and case information provides no compelling indication that additional suspects were involved. Visible stains will be screened and tested for DNA only when the questioned contributor had no legitimate or innocent access to those surfaces.

'Contact DNA' - The laboratory will strive to limit DNA testing to visible stains, residues (such as a fingerprint smudge), or materials. "**Contact DNA**" (or *touch DNA*) that is not discovered through an observable residue will be tested when the surface upon which the DNA is collected was in consistent or exclusive prolonged contact with the questioned contributor. For contact DNA evidence, the laboratory may opt to defer the analysis pending submission of elimination standards from emergency and police personnel who accessed the crime scene and anyone else who had legitimate access to the area.

**Contact DNA will be limited to 2 exhibits (swab/item) for theft/burglary cases (not including victim elimination standards)**

Vehicle burglary:

- 1<sup>st</sup> choice: Steering wheel swab (swab steering wheel with maximum of 2 swabs) over gear shift or door handles, OR,
- 2<sup>nd</sup> choice: Area broken into (such as console/glove compartment)

Residence/business burglary:

- 1<sup>st</sup> choice: Possible blood evidence, AND/OR,
- Clothing or object left behind such as hat, gloves by perpetrator, AND/OR,
- Visible smudge on glass or windows at point of entry

CODIS - The Combined DNA Index System contains DNA profiles from convicted felons, crime scene samples, unidentified human remains, and other sources. DNA profiles from questioned samples can be entered into the database if they are from evidence from a crime scene, are collected in relation to the crime, are probative to the crime, and can be associated with the putative perpetrator but were not seized directly from that person. DNA profiles from standards lawfully collected from suspects can also be entered into the database.

## Glass

### **Description of the Science**

Using microscopical, visual, and various physical measurement techniques, glass comparisons can determine whether particles of glass could have originated from a particular source.

### **Special Considerations**

Like other trace evidence examinations, glass examinations are often time consuming due to the preparatory steps that must be taken to ready evidence for analysis. For homicide or other time sensitive cases, preliminary investigative information can be provided. In most cases, however, glass examinations are limited to comparisons of unknown or questioned fragments, to standard fragments whose origin is known.

### **Susceptibility to Contamination**

Possible sources of contamination include the unintentional deposition of miscellaneous glass particles on items to be examined, such as clothing or bedding. It is imperative that glass standards and any evidence containing potential questioned glass be packaged in such a manner to eliminate the possibility of glass fragment cross contamination.

**Safety Hazards**

Glass fragments are often sharp and can puncture skin.

**Proper Packaging and Submission**

Submit samples of glass from each broken window or source in leak proof containers such as film canisters or plastic pill bottles. Avoid using paper or glass containers if possible. Collect and package the evidence, noting its location.

Submit samples of laminated glass (such as a windshield) from each side of the laminate (entire pieces of laminated glass are preferred). Label the samples INSIDE and OUTSIDE and package separately in leak proof containers such as film canisters, metal evidence containers or plastic pill bottles. Avoid using paper or glass containers.

Clearly mark the evidence packaging as containing questioned glass fragments or known glass standards.

Clothing evidence should be packaged in sealed unused paper bags. It is recommended that each article of clothing and footwear should be packaged in a separate paper bag.

## **Hair – Screening Only**

**Description of the Science**

Utilizing microscopical and visual techniques, hair examinations can determine whether hairs are animal or human. Race, body area, method of removal, damage, and alteration (that is, bleaching or dyeing) can potentially be determined from microscopical hair analysis. A determination of the species or family of an animal hair can potentially be made by microscopical hair examinations.

**Special Considerations**

Like other trace evidence examinations, hair examinations are often time consuming due to the preparatory steps that must be taken to ready the hairs for analysis. For homicide or other time sensitive cases, preliminary investigative information can be provided.

**Testing Hairs for DNA -**

The DuPage County Forensic Science Center currently has the capability to perform nuclear DNA analysis on hairs; however, hairs must first be evaluated through the microscopical examination of the condition and growth phase of the hair root, if present. Nuclear DNA testing on hairs can be performed at this laboratory; however, it is not always successful. There are some private laboratories that have specialized DNA procedures to maximize the potential for success.

Mitochondrial DNA analysis can be performed on hair fragments with no roots; however, this type of DNA typing lacks the discrimination power of nuclear DNA analysis and cannot be performed at this laboratory. Currently the FBI laboratory and some private labs perform mitochondrial DNA analysis **on selected hairs that have been screened microscopically** that are related to homicides or other criminal investigations.

DNA analysis of hairs (nuclear and mitochondrial) is destructive to the sample.

It should be pointed out that hair is a very common type of trace evidence that does not readily decay. It has been examined forensically for over a century, along with other types of evidence, and in some instances it may be the only physical evidence available in a criminal investigation. Its potential value cannot be overemphasized.

**Susceptibility to Contamination**

Possible sources of contamination include the unintentional deposition of miscellaneous hairs on items to be examined, such as clothing or bedding. This contamination can come from ambient surroundings, from law enforcement personnel, or from sample to sample cross-contamination. Cross contamination of hairs

can be minimized at crime scenes with the routine use of clean, disposable garments such as, caps, booties, latex gloves and hooded coveralls.

### ***Safety Hazards***

There are no specific safety risks associated with this kind of evidence. Other hazards, however, may exist warranting the exercise of universal precautions.

### ***Proper Packaging and Submission***

Individual hairs should be placed in a paper fold and submitted in sealed envelopes or bags to prevent loss or cross-transfer. Questioned hairs can be collected from large or bulky item surfaces, not suitable for submission to the laboratory, with transparent lifting tape. The laboratory currently uses Scotch brand 845 Book Tape that is 3 inches wide. Another suitable transparent lifting tape is Scotch brand 600 Transparent Tape that is 2 inches wide. The tape rolls should always be stored in a clean resealable plastic bag when not in use. Recent hair and fiber transfers can be collected and preserved by taping and lifting off of a surface until the tape begins to lose some tackiness. The tape lift is then folded over itself so that the tacky surfaces are protected from possible contamination. The folded tape lift should be no more than 5 inches in length and the tape should be evenly folded so that no adhesive surfaces are exposed. Tape lifts can be stored in sealed envelopes. Tape lifts and all other packaging should clearly indicate the location or person from which the sample was collected. Garments or other cloth materials should be dry and secured in paper or cardboard.

## ***Intoxicating Compounds***

### ***Description of the Science***

Utilizing the scientific principles of chemistry, the laboratory is able to analyze unknown liquids and gases for the presence of intoxicating compounds as defined under the Use of Intoxicating Compounds Act, Illinois Compiled Statutes, §720 ILCS 690. Analytical data generated by our instrumentation is compared against known standards, allowing the forensic chemist to conclusively identify the presence of these substances. The use of compounds such as nitrous oxide, toluene, acetone, and gasoline for their intoxicating effects is prohibited by law.

### ***Special Considerations***

Samples must be submitted as soon as possible due to the volatility of some compounds. The laboratory should be advised of how much time has passed between sample collection and sample submission.

### ***Susceptibility to Contamination***

Possible sources of contamination include the unintentional introduction of specific compounds by sample cross-contamination.

### ***Safety Hazards***

Exposure to substances of unknown origin represents a significant health and safety hazard. This exposure may be through ingestion, respiration, or absorption through direct contact with the skin or mucous membranes.

### ***Proper Packaging and Submission***

Liquid samples should be submitted to the laboratory in a secured and sealed vial or bottle. The sample should be kept refrigerated at all times. The sample size should be small (2mL vials are preferred). Other items that are suspected to contain intoxicating compounds should be sealed and secured in vapor tight containers, preferably arson cans. Please refer to the section on Flammables & Combustibles for other packaging information.

## **Other Resources**

***Questioned Document (Handwriting Analysis), Soil Comparisons & Explosives***  
**Federal Bureau of Investigation (FBI) Laboratory**

Quantico, Virginia  
 Main Line: (703) 632-7690  
 Questioned Document Unit: (703) 632.8444  
 Soil Comparisons: (703) 632.8449  
 Explosives Examination Unit: (703) 632.7626

***Questioned Document/Ink Analysis***  
**IRS National Forensic Laboratory**

525 W. Buren, Suite 400  
 Chicago, IL 60607  
 Questioned Document Section: (312) 542-7808

***Accidental Poison Identification***  
**DuPage County Health Department**

(630) 682-7400

***Cases involving possible intentional food or beverage contamination***

**Illinois Department of Public Health**  
 (312) 793-4758 or (217) 782-4977

**Poison Control Center**

(800) 222-1222

**SET Laboratories**

(847) 537-9221, Contact Bijan-Saeedi

***Soil Comparisons, Explosives & Lamp Filaments***

**Microtrace - Skip Palenik**

Elgin, Illinois  
 (847) 742-9909

***Forensic Dentistry / Bite mark examinations***

**Dr. Denise Murmann, DDS, DABFO**

2531 W. 75th Street, Suite 202  
 Naperville, IL 60540  
 (630) 718-1234  
[murmanndc@sbcglobal.net](mailto:murmanndc@sbcglobal.net)

***Forensic Entomology***

**Neal Haskell, PhD**

425 Kannal Avenue  
 Rensselaer, IN 47978  
 (219) 866-7824 Fax: (219) 866-7628

***Counterfeit Money***

Secret Service  
**1050 Connecticut Avenue, NW**  
**Washington, DC 20036**  
**(202) 406-5708**

***Toxicology and DUI Kits***

**ISP Chicago**

Toxicology Unit

***International Forensic Automotive Paint Data Query (PDQ)***

***Gunshot Residue Analysis***

***Fiber & Paint Analysis***

**ISP Chicago**

Trace/Microscopy Unit

***Firearms, Toolmarks***

**ISP Chicago**

***Latent Print Analysis***

***Shoe & Tire Impressions***

**ISP Chicago & Joliet**

Criminalistics Unit

**Illinois State Police**

**Forensic Science Center at Chicago**

1941 West Roosevelt Road  
 Chicago, IL 60608  
 Main Line: (312) 433-8000

**Illinois State Police**

**Joliet Forensic Science Laboratory**

515 East Woodruff Road  
 Joliet, IL 60432  
 Main Line: (815) 740-3543