FORENSIC SCIENCE CENTER
OFFICE OF THE SHERIFF - JOHN E. ZARUBA

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Forensic Science Handbook

Sixteenth 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 American Society of Crime Laboratory Directors Laboratory Accreditation Board to the ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration Laboratories" the ASCLD/LAB-International Supplemental Requirements for Testing Laboratories: 2011 and all other requirements of the ASCLD/LAB-International program, certificate number: ALI-014-T.

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General Information and Instructions

Scientific Services

Some excerpts of this handbook were quoted or paraphrased from the FBI Handbook of Forensic Services, 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 large 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.

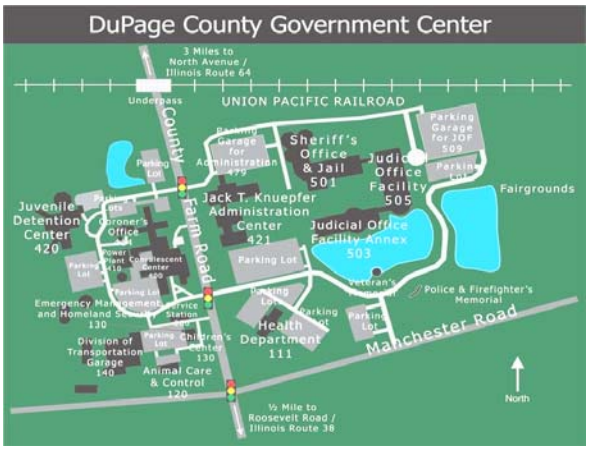
What all Agencies Must Know

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

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) 407-2096

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 more timely 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 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 16-0093-03 where:

- 16 is the year, 2016, in which the case was created.
- 0093 represents the ninety-third case accepted by the lab in 2016.
- 03 represents the third testing report issued for case number 16-0093.

The results communicated in a laboratory testing report contain observations, results, and conclusions rendered by a scientist who has the requisite training and experience 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.

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.** Be sure to take your time and thoroughly fill in all of the necessary information. 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%2015%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 (Service not currently available)*
> *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.

Submit Best Evidence First
In many cases, particularly the more complex ones, at-scene investigators may have a myriad of items to collect for submission to the laboratory. Investigators should know specifically why a particular piece of evidence is of probative value and make attempts, either verbally or in writing, to communicate this to the laboratory.

The submission of excessive amounts of evidence to a forensic science laboratory creates two fundamental problems. First, the effort the scientist will have to manage a pile of questionable items hinders the scientist's ability to "reconstruct" how they may have been involved in the crime, which is ultimately what investigators want to know. Second, the case will take longer to work, delaying the reporting of results that may be time-sensitive.

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 reviewcontact Mary at 630.407.2111 or via email at 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 Statues. §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. Drug identification testing is not conducted 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.

- Please 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

Explosives

Description of the Science
Utilizing the scientific principles of chemistry and microscopy, the laboratory is able to identify the presence of explosive mixtures in submitted samples. Analytical data generated by instrumentation and visual inspection is compared against known standards, allowing the forensic chemist to conclusively identify the presence of explosive mixtures or residues.

Special Considerations
The laboratory routinely accepts suspected explosive powders from improvised explosive devices (IED's) such as pipe bombs, M-devices (i.e. M-80's) and chemical reaction (pop bottle) bombs.

The laboratory will not accept primary explosives such as blasting caps. The safety of the officer during transport, and the safety of laboratory personnel must be vigilantly protected.

The laboratory will also not accept commercially manufactured and military high explosives such as Dynamite and plastic explosives, nor explosive residues from explosions suspected of being caused by such devices. In cases involving the analysis of these types of explosives contact the Bureau of Alcohol, Tobacco, and Firearms or the Federal Bureau of Investigation Laboratory..

It is noted that the majority of explosive devices encountered in this county, as of the time of this writing, are improvised low explosives and samples of these types of devices are routinely submitted to the DuPage County Forensic Science Center for analysis.

Susceptibility to Contamination
Possible sources of contamination include the unintentional introduction of explosive mixtures 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.

Explosives pose a significant safety hazard of their own. The instability of explosive mixtures can cause an explosion. Some mixtures can be absorbed rapidly through the skin causing, in some cases, severe headaches. Call the Sheriff's radio room at (630) 407-2400 to contact a member of our Hazardous Device and Explosives Unit.

Proper Packaging and Submission
All explosive or hazardous devices must be rendered safe by a qualified technician prior to submission to the laboratory. After rendering the device safe, the bomb technician will provide the laboratory with a small representative sample (filled 4 mL vial with Teflon lined cap) of explosive powder in a sealed glass vial for analysis.

The remains of exploded IEDs and surrounding solid materials suspected of containing explosive residue should be collected in an unused metal can with a securing lid. The submission of soil / dirt should be avoided.

The remains of exploded pop bottle bombs should be submitted in either a plastic evidence bag or if fingerprint processing is requested, place the exploded pop bottle in a sealed gray epoxy lined paint can. A portion of any remaining liquid should be submitted to the laboratory in a sealed glass vial preferably with a Teflon lined screw cap. This liquid is typically highly caustic / corrosive and extreme caution must be used when handling such materials.

It is recommended that evidence submitted for explosive residue analysis be submitted as soon as possible to avoid potential chemical degradation due to long-term storage.

Fibers

The laboratory does not provide analysis of fiber evidence at this time. Please submit this evidence to the Illinois State Police.

Latent Prints

The laboratory is in the process of reestablishing latent print services. Until further notice all evidence requiring latent print examination should be submitted to the Illinois State Police.

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 conclusively identify the presence of accelerants.

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 hair and body fluids. FB currently provides presumptive tests for blood, semen, and saliva, and one 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.

<u>How to Collect Questioned Samples</u> - When samples are small and easily transportable, such as a cigarette butt or a t-shirt, they can be collected and packaged whole. In many 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, nylon or other fiber and rub this across the stain. This may be followed by a dry swab, but if so, note which swab is the wet swab and which is the dry swab. 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 may be collected from a nearby area, but due to the sensitivity of DNA and the semi-quantitative nature of DNA results, the laboratory does not typically test controls.

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 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.

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 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.

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.

Paint

The laboratory does not provide analysis of paint at this time. Please submit this evidence to the Illinois State Police.

Shoe and Tire Impressions

The laboratory does not provide analysis of shoe or tire tread impression evidence at this time. Please submit this evidence to the Illinois State Police.

Toolmarks

The laboratory does not provide analysis of toolmark evidence at this time. Please submit this evidence to the Illinois State Police.

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 & 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

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
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