Minnesota Bureau of Criminal Apprehension
Forensic Science Service

Evidence Submission Guidelines

Saint Paul and Bemidji Testing Laboratories

Table of Contents

Preface 3
1.0 Introduction 4
2.0 Contact Information and Hours 4
3.0 Services Provided by MN BCA FSS – Testing Laboratories....5
4.0 Coverage Area 6
5.0 General Safety Information 7
6.0 General Case and Evidence Acceptance Policies 8
7.0 General Evidence Collection 9
8.0 Sealing 12
9.0 Case Information....14
10.0 Section Specific Submission Requirements 15
10.1 Controlled Substances 15
10.2 Toxicology 18
10.3 Trace Evidence 24
Trace-Micro 24
Trace-Chemical Testing 29
10.4 Biology....32
Nuclear DNA....32
CODIS 36
Mitochondrial DNA (mtDNA) 36
10.5 Firearms and Toolmarks 39
Firearms 39
Toolmark Evidence....43
10.6 Questioned Documents 44
10.7 Latent Prints....46
10.8 Crime Scene 49

Preface

The purpose of this document is to offer general guidance to law enforcement agencies throughout the state of Minnesota on how to effectively submit evidence to the MN Bureau of Criminal Apprehension Forensic Science Service (MN BCA FSS). Proper evidence handling is necessary to ensure the preservation of the evidence, the integrity of analytical results, and the admissibility of the evidence in a court of law.

NOTE: Case acceptance policies issued by the MN BCA FSS will supersede the requirements listed in this manual.

1.0 Introduction

The MN BCA FSS is part of the Minnesota Bureau of Criminal Apprehension (BCA), established and given legal authority under Minnesota Statute 299C as a division of the Minnesota Department of Public Safety. The MN BCA FSS provides quality forensic science testing, written reports of results, calibration of evidentiary breath alcohol instruments and issuance of the calibration certificates and subsequent expert testimony on matters relative to criminal statutes. Laboratory services are provided to the Minnesota criminal justice community from its headquarters in St. Paul and/or its regional laboratory in Bemidji.

2.0 Contact Information and Hours

Minnesota Bureau of Criminal Apprehension
Forensic Science Service – St. Paul
1430 Maryland Avenue East
St. Paul, MN 55106-2802
Phone: (651) 793-2900
Fax: (651) 793-2901
email: bca.lab.vault@state.mn.us
website: https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science
Evidence Intake Hours of Operation:
Monday through Friday from 8:00 a.m. to 3:00 p.m.

Minnesota Bureau of Criminal Apprehension
Forensic Science Service – Bemidji
3700 North Norris Court NW
Bemidji, MN 56601
Phone: (218) 755-6600
Fax: (218) 755-6623
Evidence Intake Hours of Operation:
Monday through Friday from 8:00 a.m. to 4:30 p.m.

3.0 Services Provided by MN BCA FSS – Testing Laboratories

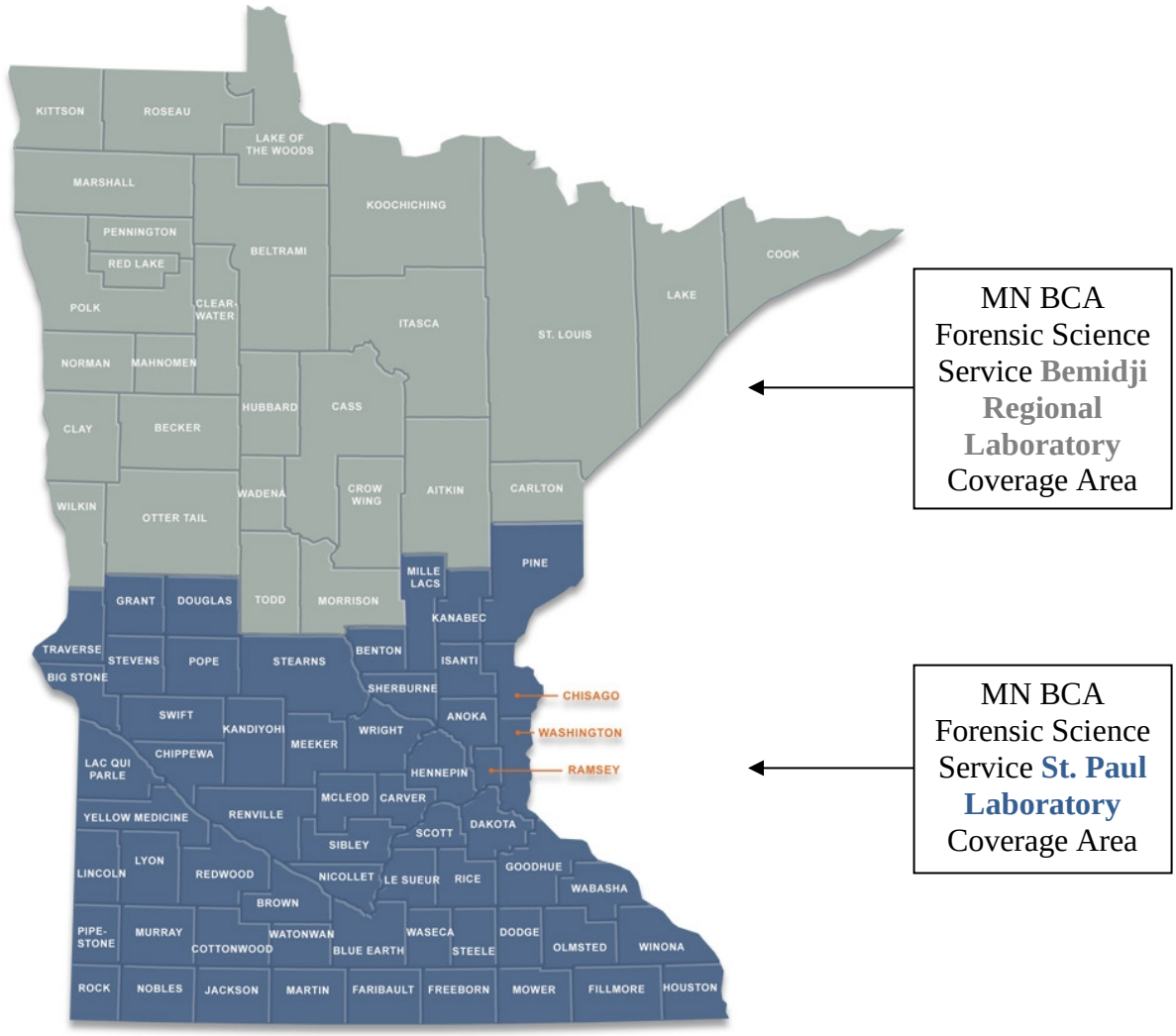
The MN BCA FSS - Testing Laboratories provide forensic testing in the disciplines of controlled substances, toxicology, trace evidence, biology, firearms and toolmarks, questioned documents, latent prints, and crime scene:

Discipline	Categories of Testing	St. Paul	Bemidji
Controlled Substances	General Controlled Substance Analysis	X	X
Toxicology	Blood/Urine Drug	X	
	Blood/Urine Alcohol	X	
Trace Evidence	Paint	X	
	General Physical and Chemical Analysis	X	
	Fiber and Textiles	X	
	Glass	X	
	Hair	X	
	Fire Debris	X	
	Impression Evidence (footwear/tires)	X	
Biology	DNA - Nuclear	X	X
	Serology	X	X
	DNA - Mitochondrial	X	
	Databasing (CODIS and Mitochondrial)	X	
	Bloodstain Pattern Analysis	X	
Firearms / Toolmarks	Firearms	X	X
	Toolmarks	X	X
	Databasing (NIBIN)	X	
Questioned Documents	General Document Examination	X	
Latent Prints	Latent Print Comparisons	X	X
	Latent Print Processing	X	X
Crime Scene	Crime Scene Processing	X	X
	Bloodstain Pattern Interpretation	X	X
	Scene Reconstruction – Trajectory	X	X

4.0 Coverage Area

When specific forensic testing is offered at both locations, agencies from the following northern counties are routinely serviced by the Bemidji Regional Laboratory:

Aitkin	Cook	Lake of the Woods	Polk
Becker	Crow Wing	Mahnomen	Red Lake
Beltrami	Hubbard	Marshall	Roseau
Carlton	Itasca	Morrison	St. Louis
Cass	Kittson	Norman	Todd
Clay	Koochiching	Otter Tail	Wadena
Clearwater	Lake	Pennington	Wilkin



MN BCA Forensic Science Service **Bemidji Regional Laboratory** Coverage Area

MN BCA Forensic Science Service **St. Paul Laboratory** Coverage Area

5.0 General Safety Information

Physical evidence being submitted for forensic testing can pose significant safety hazards to both our customers and MN BCA FSS personnel. It may not always be possible to determine if evidence poses a biological or chemical hazard, so it is imperative to follow universal safety precautions when handling all evidence. According to the concept of Universal Safety Precautions, all human blood and certain body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other bloodborne pathogens. Any body fluid must be handled with caution.

Other potentially infectious materials include, but are not limited to semen, vaginal secretions, cerebrospinal fluid, synovial (joint) fluid, pleural (lungs) fluid, pericardial (around heart) fluid, peritoneal (abdominal) fluid, amniotic (around fetus) fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids. In addition, any unfixed tissue or organ (other than intact skin) from a human (living or dead). Bodily fluids such as feces, sweat, tears, nasal secretions, vomit, and urine (when they are not contaminated with blood) can still transmit infectious diseases so caution is advised.

Evidence that consists of or may contain a potentially infectious material (e.g. a tube of blood or a shirt suspected of containing blood staining) must be plainly marked with biohazard stickers. If submitting infectious evidence containing HIV, HBV, or other contagious biohazard substances, this information must be noted in your paperwork.

Suspected hazardous chemicals must also be marked accordingly.

6.0 General Case and Evidence Acceptance Policies

The MN BCA FSS will receive and examine evidence submitted by the criminal justice community investigating a potential criminal action within the state of Minnesota. The acceptance of evidence from other entities is at the discretion of the MN BCA FSS Director.

The following types of cases and/or evidence not generally accepted by the MN BCA FSS include, but are not limited to:

-Evidence from private individuals.

-Non-criminal, not capable of being charged criminally, or not probative in a cause of death determination.

-Requests which limit the scope of the agency's investigation.

-"Compromised" or affected evidence that renders scientific examinations invalid.

-Previously examined evidence by another laboratory or MN BCA FSS personnel. The Assistant Directors or Director may allow exceptions to this policy on a case-by-case basis. Exceptions may include:

- The requests for examinations involve the use of new or different techniques/methods that were not previously available.

- Hair cases where determination of race, somatic origin and/or DNA suitability may be reevaluated as part of the routine comparison examination of the hair.

7.0 General Evidence Collection

Proper packaging, identification, and sealing of evidence is imperative to its preservation and integrity. The likeliness of laboratory personnel obtaining the greatest evidential value from the submitted evidence is increased when proper collection techniques are followed. Remember that you may be a potential source of contamination; therefore, it is crucial to wear latex or nitrile gloves when handling evidence. Keep in mind to change gloves between handling different items of evidence.

Evidence should be packaged separately so that cross contamination cannot occur. If the potential for cross contamination does not exist, like items may be packaged together (e.g. inked elimination prints, latent print lifts from a specific collection area). Evidence should be packaged in their entirety. This will protect from further contact with other objects and to possibly prevent loss of trace evidence. Evidence should be submitted dry (e.g. bloody clothing, plant material). Evidence should be protected to avoid breakage and/or leakage. Only submit items that need analysis.

Use new packaging material when preparing evidence to be submitted to the MN BCA FSS. This will avoid the possibility of the evidence encountering a contaminant within the previously used material. Packaging material is available in a variety of shapes and sizes. Choose a size that is appropriate for the evidence (e.g. coin envelopes for trace items). Appropriate packaging includes but is not limited to: paper bags or envelopes, sturdy cardboard boxes, plastic bags, metal cans, and glass vials.

Paper material is suitable for a variety of evidence given its porous property which allows residual moisture to escape. Paper bags are appropriate to use when submitting clothing evidence. Manila envelopes are the preferred material when submitting trace samples or swabs. Envelopes with windows allow for the evidence to be viewed without disturbing the seals.

Fig. 7- 1, 7-2(a) and 7-2(b): Paper bags and manila envelopes (with or without windows) are available in a variety of sizes and types. Envelopes are available padded for evidence requiring special care. It is beneficial to have an assortment of sizes and types available to ensure proper evidence packaging.

Cardboard boxes work well for large and bulky items (commonly used for firearms and knives). Cardboard (excluding those with a wax coating) is a porous material like paper and will allow residual moisture to escape.

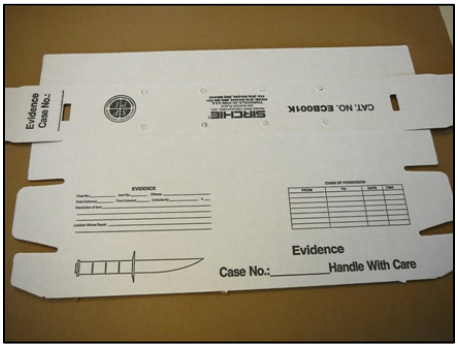


Fig. 7- 3: Specialty evidence cardboard boxes can be purchased for items such as knives and firearms.

Plastic is a suitable packaging material given its strength and transparent nature which allows laboratory personnel to easily observe the contents; however, it is not appropriate for all types of evidence (for Controlled Substance Evidence, refer to Section 10.1). Things to remember with plastic is moisture will be trapped sometimes causing deleterious change to occur if the submitted evidence was not dry (e.g. wet plant material will become moldy within a plastic bag). Make sure the evidence is completely dry before placing it in the plastic bag.

Fig. 7- 4 and 7-5: Plastic bags are available in a variety of sizes and types. It is beneficial to have an assortment of sizes and types available to ensure proper evidence packaging.

New and clean paint-like lined metal cans with tight fitting friction lids are the standard packaging preference for volatile, non-biological samples. The metal can traps the hydrocarbon vapors inside, preventing evaporation. Most commonly encountered samples submitted in metal cans are flammable liquid accelerants found in fire debris (e.g. lighter fluid, gasoline).

Fig. 7- 6: New and clean paint-like lined metal cans with tight fitting friction lids are available from paint wholesalers. It is beneficial to have an assortment of sizes on hand to ensure proper evidence packaging.

Glass containers are ideal for packaging liquid samples (e.g. clandestine laboratory samples). Ensure that the glass container has a well fitted top. Once the evidence is contained within the glass container, make certain it is protected from breakage and/or leakage.

Fig. 7- 7: Clan lab packs such as the one pictured above are ideal for packaging liquid samples.

For more section specific packaging details, consult the appropriate section within this manual. If you still have questions regarding proper evidence packaging, do not hesitate to contact the MN BCA FSS and our personnel will assist you. Again, proper packaging, identification, and sealing of evidence is imperative to its preservation and integrity.

8.0 Sealing

Evidence must be properly sealed prior to acceptance by the MN BCA FSS. Evidence is properly sealed when its packaging is secured to prevent loss, cross-contamination, cross-transfer, other deleterious change, and/or unauthorized access to the contents would be detectable. An acceptable seal covers the entire opening on the packaging container. Manila envelope clasps, ziplocked plastic bags, and staples alone do not constitute an acceptable seal. They must be accompanied by a tape or heat seal. A proper seal includes the initials of the sealer. Initials must be permanent in nature.

Oversized items or evidence with other characteristics making its placement into a sealable package impractical (e.g. doors bearing toolmarks, furniture, etc.) need to have at minimum the area of interest covered to protect from loss or alteration. Some sort of marking or identifier must be in place so the item of evidence can later be shown to be the item examined. Identification of this sort can be accomplished using indelible markings, engraved markings, or a unique number (e.g. serial number) attached to the item.

If it is determined that evidence cannot be accepted by the MN BCA FSS for examination due to an improper seal, the agency will be contacted immediately to determine the correct return of the evidence.

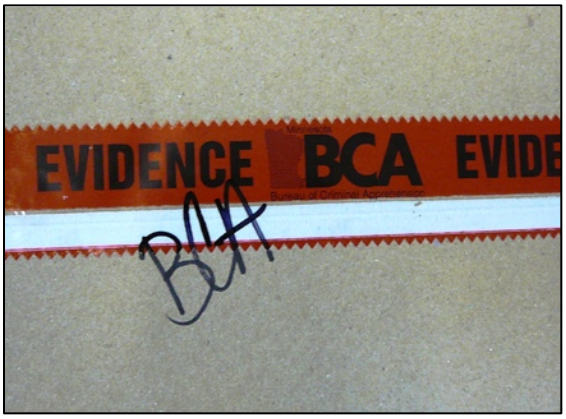


Fig. 8- 1: A proper seal includes the permanent initials of the sealer.

There are a variety of approaches one can take to properly seal evidence. The most commonly encountered methods of sealing evidence at the MN BCA FSS include heat seals, staples with tape or heat combination, tamper-proof evidence tape, tamper-proof adhesive strips, or a combination of these.

The heat sealing method is used with plastic packaging. The heat partially melts the plastic packaging and fuses it together. Keep in mind that some plastic material is thicker than others. To achieve a proper seal, temperature and time requirements of the heat sealer will vary. Ensure that the plastic has fused together. Initial across the heat seal with a permanent pen.

Fig. 8- 2: A proper heat seal needs to be initialed by the sealer with a permanent pen. Keep in mind that plastic material can vary in thickness. A different time/temperature combination may be required. Ensure that the plastic has fused together.

Staples are often used to secure paper bags. When using staples, close the opening of the container and fold it over more than once. Staples should be placed in several locations along the fold to ensure it is properly shut. Use caution to ensure staples do not go through the evidence. Cover the staples with a tamper-proof evidence tape or reinforced packaging tape to properly seal. Initial across the seal with a permanent pen.

Tamper-proof evidence tape is available in a variety of sizes, colors, and can even be customized with your department name. It is a highly sensitive, tamper indicating tape. Many have serrated edges that will cause the tape to tear if removal is attempted. Tamper-proof evidence tape is marketed to provide a secure seal on all packaging materials; however, it is always good practice to test the tape on commonly used packaging (e.g. plastic) prior to using it to seal evidence. Due to its sensitive properties, it is recommended to use another method of sealing (e.g. staples, clear tape) if any type of stress has or could occur to the seal. Initial across the seal with a permanent pen.

Tamper-proof adhesive strips are typically encountered on plastic evidence bags. The adhesive strip provides a quick and easy method for sealing the plastic bag. Just remove the plastic backing and seal. If any attempt is made to open the seal, the plastic will become distorted. Once sealed, initial across the seal with a permanent pen.

Fig. 8- 3 and 8-4: Evidence/Property plastic bags can be purchased with tamper-proof adhesive strips. These provide a quick and easy method for sealing a plastic bag. Ensure that the bag has been sealed and initialed by the sealer with a permanent pen.

9.0 Case Information

When submitting new or additional evidence, it is recommended to use the Minnesota BCA Forensic Science Service Analysis Request Form (001-EV). This request form provides essential case details needed for our records and to ensure that the types of forensic testing that would prove most probative will be employed. For controlled substance only cases, please use form BCA Drug Chemistry Evidence Analysis Request (017-EV). Make sure the request form is legible by hand printing or typing. If there are special circumstances (e.g. rush analysis needed for court) note this on the request form. In addition to our form, we suggest that you send a copy of your report, which can provide useful information to the personnel performing the forensic testing (e.g. location of evidence when collected). If you have any questions on what case information needs to be supplied, contact the MN BCA FSS and our personnel will assist you. If using your own form, at a minimum, we require the following information:

1. Name of the submitting agency
2. County
3. Agency case number
4. Case officer name, phone number, and email
5. Case type (charge for controlled substance cases (possession, sales))
6. Date of offense
7. Victim/suspect/elimination name(s) and date of birth(s)
8. Description of item
9. Examinations requested
10. State SID number if available
11. Court date, if known (court date is required for some controlled substance cases – see section 10.1)
12. If submitting additional evidence, indicate that this is additional evidence in your paperwork. List the BCA laboratory case number if known

10.0 Section Specific Submission Requirements

All sections of the testing laboratory have specific requirements regarding your submission and delivery of evidence to the laboratory. The following section specific information is not necessarily all inclusive, so contact the MN BCA FSS if you need further assistance.

The MN BCA FSS Website also contains helpful information with regards to services provided and section specific submission requirements. Check out the MN BCA FSS Website at:

https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science

NOTE: All submission links referenced within this document can be accessed on the Evidence Submission page:

https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/evidence-submission.aspx

10.1 Controlled Substances

The Drug Chemistry section analyzes and identifies suspected controlled substances. This includes clandestinely manufactured products as well as legitimately manufactured pharmaceutical products. The scientists also identify controlled substances found in various psychoactive plant materials. Identifications are typically made utilizing gas chromatography/ mass spectrometry (GC/MS) and/or Fourier Transform Infrared Spectrometry (FTIR) instrumentation. Marijuana is routinely identified by a combination of color tests and microscopic examinations.

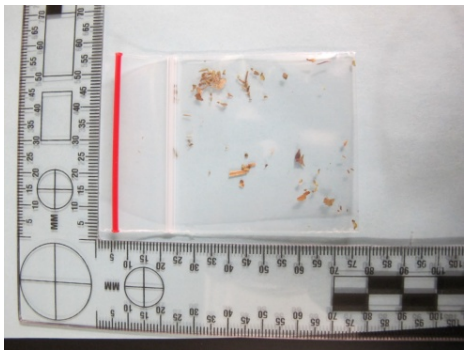
Case and Evidence Acceptance (NOTE: a revised case acceptance policy for controlled substances was issued on April 15, 2014)**:**

- Controlled substance evidence must be submitted in a clear plastic bag (or a window manila envelope), such that the item(s) for analysis are visible for inspection through the packaging prior to acceptance. As an example, baggies seized in a cigarette pack must be removed from the pack and secured in a plastic bag/window manila envelope before submission. The cigarette pack should only be submitted if other types of examinations are necessary.
    - Exceptions to the packaging requirement will be made for plant material, mushrooms and other evidence where the growth of mold is a concern. These items may be packaged in paper bags to allow for breathing of the material.
    - If mailed, drug evidence must <u>also</u> be secured in a container suitable for mailing purposes

- Trace amount, paraphernalia, and syringe content cases will be accepted if they have an offense date of April 15, 2014 or later and meet all of the following criteria unless prior approval from laboratory management has been obtained:

    - The evidence has a visible amount of substance on/in it. The photographs below are being provided to assist you in evaluating whether drug evidence items fit under this criterion

0.01 Gram of Powder



0.01 Gram of Plant Material

    - The case information includes a written statement from the prosecuting attorney indicating that the suspect has pled not guilty or rejected a plea agreement and a trial has been scheduled. The date of the trial must be included. The court file number is desired.

    - One item per suspect per case may be submitted.

    - Evidence must be received by the laboratory at least 10 business days prior to the trial date.

- Marked pharmaceutical tablets and/or capsules that meet all of the following criteria will be accepted:

    - The markings indicate a controlled substance. Pharmaceutical tablets and capsules can often be identified through their imprint code. It is suggested to consult reference books (e.g. Physicians' Desk Reference - PDR), contact a local pharmacist, poison control, or the online references:

        http://www.drugs.com/pill_identification.html
        http://www.pharmer.org/

    - If you have several tablets/capsules that are the same, please only submit one for analysis

- The case information includes a written statement from the prosecuting attorney indicating that the suspect has pled not guilty or rejected a plea agreement and a trial has been scheduled. The date of the trial must be included. The court file number is desired.

- Evidence must be received by the laboratory at least 10 business days prior to the trial date.

- Marijuana cases will be accepted when the case information includes a written statement from the prosecuting attorney indicating that the suspect has pled not guilty or rejected a plea agreement and a trial has been scheduled. The date of the trial must be included. Evidence must be received by the laboratory at least 10 business days prior to the trial date. The court file number is desired.

- Evidence that had the potential to come in contact with body fluids must be clearly marked with a biohazard sticker on the outer package.

  - Syringes (with or without needles) <u>will not</u> be accepted. The liquid contents of the syringe should be expressed into a clean vial for submission. Swabs of the interior of syringes will not be accepted.

  - Suspected controlled substances that have been recovered from a body cavity <u>must</u> be removed from the original packaging prior to submission. The original packaging containing the biohazard material should not be submitted. However the evidence must still be labeled as a biohazard.

- Analysis will be performed only on the number of items necessary to reach the maximum charging level.

- Evidence in clandestine laboratory cases will be analyzed only to the level of identifying the precursor or final product.

- Quantitations to determine purity will only be done for Federal cases.

  - All cases requiring purity determination (quantitation) should be sent to the St. Paul location.

  - Provide contact information for the prosecuting attorney and indicate any trial dates if known

- Salt form determination of cocaine is only reported for cases that will be federally prosecuted.

- Items NOT to submit

- Non-drug items and drug items in a case that do not need to be examined
- Field test kits

Sealing, Marking and Submitting Controlled Substance Evidence:

- Mark and identify each container with:
  - Agency case number
  - Suspect
  - Date(s) of multiple buy(s)
  - Location where each piece of evidence was found
- Seal appropriately in a suitable container. (**One Agency Case Per Container**) Do not use a DWI kit for mailing drug evidence
- Do not mix drug types in one container unless found that way.
- Air dry wet samples (especially live marijuana plants)
- Package individual items of evidence separately and keep items for separate defendants packaged separately. Provide information concerning which defendant is associated with which item.
- Do not heat-seal into "compartments".
- Take a representative sampling of liquids (30 milliliters/1ounce or less). Package in appropriate "clan lab" packs (glass vial with Teflon-lined cap stored in a Nalgene bottle)
- The charging level for khat is not weight dependent – submit one bundle. If the khat is fresh, keep it frozen.
- Latent Prints on Packaging – if latent print examination needs to be performed on the packaging, separate the drug items from the original packaging material (except in trace residue cases where latent prints are also required).

Links to Controlled Substance references:

- BCA Drug Chemistry Evidence Analysis Request (017-EV)

10.2 Toxicology

The Toxicology section analyzes blood, urine, and other biological samples for the presence and concentration of volatiles utilizing gas chromatography (GC) technologies.
These biological samples can also be screened for drugs of abuse (barbiturates, phenytoin, benzodiazepines, opiates, GHB, THC, cocaine, phenethylamines, phencyclidine,

propoxyphene, norpropoxyphene, methadone, carisoprodol and meprobamate) as well as less common substances. These drugs can then be confirmed and quantitated utilizing gas chromatography / mass spectrometry (GC/MS), liquid chromatography / mass spectrometry (LC/MS/MS) technologies.

1. Make sure the integrity seals of the kit are intact before using.

Fig. 10.2- 1 and 10.2-2: Blood kit with integrity seal (left) and urine kit with integrity seal (right).

2. Kit information sheets included inside must be completely and legibly filled out and returned to the inside of the kit box. Make sure to indicate what you want the kit tested for, alcohol and/or drugs, giving specific drugs if known.

Fig. 10.2- 3 and 10.2-4: Blood kit contents (left) and urine kit contents (right).

3. Mark blood tubes and urine container with appropriate information and seal and initial all seals before mailing or submitting by hand.

4. The green Medical Personnel Certificate (MPC) that is included in the blood kit is to be kept by the agency.

5. If the case involves a DRE officer, add the DRE officer to the additional distribution so they receive a report. Attorneys may not be added to the report distribution. Troopers and DNR officers may not receive reports at their homes.

6. Probation violations are not accepted by the laboratory. These kits will be returned to the submitting agency.

7. Blood, urine and fatality kits do not need to be accompanied by a Minnesota Forensic Science Laboratory Analysis Request Form.

Toxicology Sample Collection Guidelines

Sample	Recommended	Acceptable Alternative	Not Acceptable	Remarks
Blood	BCA DWI Blood Collection Kit (contain grey-topped tubes) BCA Postmortem Blood Collection Kit (contain grey-topped tubes Grey-topped blood collection tubes (contain sodium fluoride/potassium oxalate) Red-topped blood collection tubes (contain no preservatives) Purple-topped blood collection tubes (contain EDTA)	Red and grey-topped blood collection tubes (serum gel separators) Green-topped collection tubes (contain heparin)	Yellow-topped blood collection tubes (contain citrate-cannot screen for drugs)	Avoid blood draws from the same arm with the IV insertion.
Urine	BCA DWI Urine Collection Kit (contain sodium fluoride) Red-topped blood collection tube (contain no preservatives)	Hospital urine specimen cup (contain no preservatives)		Avoid urine collection from a catheter bag.
Vitreous Humor	Red-topped blood collection tubes (no preservatives)			

Sample	Recommended	Acceptable Alternative	Not Acceptable	Remarks
Tissue Samples				The BCA no longer accepts tissue samples for toxicological analysis.
Other				Other body fluids may be accepted on a case by case basis.

Toxicology Drug Assay Table

The Toxicology Section currently performs the following drug analyses. Please be as specific as possible when requesting drug analyses.

Analyte	**Blood** Lower Limit of Quantitation (mg/L)	**Urine** Typical Lower Limit of Reporting (mg/L)
Amphetamines		
Amphetamine (Dexedrine, Biphetamine)	0.01	0.02
Cathinone (Khat)	0.01 (qualitative)	0.02
Ephedrine (Primitine, Quadrinal)	0.01	0.02
Pseudoephedrine (Sudafed)	0.01	0.02
Phenylpropanolamine (Norephedrine)	0.01	0.02
Phentermine (Adipex-P, Fastin, Ionamin, Obe-Nix, Zantryl)	0.01 (qualitative)	0.02
Methamphetamine (Crank, Desoxyn, ICE, Speed)	0.01	0.02
Methylenedioxymethamphetamine (Ecstasy, MDMA, XTC)	0.01	0.02
Methylenedioxyamphetamine (Love Drug, MDA)	0.01	0.02
Barbiturates		
Amobarbital (Amytal)	0.05	0.05
Butalbital (Fiorinal)	0.05	0.05
Pentobarbital (Nembutal)	0.05	0.05
Phenobarbital (Luminal)	0.1	0.1
Secobarbital (Seconal)	0.05	0.05
Benzodiazepines		
Alprazolam (Xanax)	0.0025	0.005
Alpha-Hydroxyalprazolam	0.0025	0.005

Analyte	**Blood** Lower Limit of Quantitation (mg/L)	**Urine** Typical Lower Limit of Reporting (mg/L)
Clonazepam (Clonipin, Klonopin)	0.0025	0.005
7-Aminoclonazepam	0.0025	0.005
Diazepam (Valium, Valrelease)	0.0025	0.005
7-Aminoflunitrazepam (Rohypnol metabolite)	0.0025	0.005
Desalkylflurazepam (Dalmane metabolite)	0.0025	0.005
Lorazepam (Ativan)	0.0025	0.005
Midazolam (Versed)	0.0025	0.005
Alpha-hydroxymidazolam	0.0025	0.005
Nordiazepam	0.0025	0.005
Oxazepam (Serax, Serenid-D)	0.0025	0.005
Temazepam (Restoril)	0.0025	0.005
Triazolam (Halcion)	0.0025	0.005
Alpha-Hydroxytriazolam	0.0025	0.005
Cannabinoids (marijuana)		
Delta-9-tetrahydrocannabinol (THC)	2.0 ug/L	---
11-Nor-9-carboxy-THC	2.0 ug/L	2.5 ug/L
11-Hydroxy-THC	2.0 ug/L	---
Carisoprodol		
Carisoprodol (Soma)	1	1
Meprobamate (Equanil, Miltown)	1	1
Cocaine		
Cocaine	0.01	0.01
Benzoylecgonine	0.02	0.02
Cocaethylene	0.01	0.01
Opiates		
Codeine (Empirin, Fiorinal)	0.01	0.02
Hydrocodone (Dihydrocodeinone, Lortab, Vicodin)	0.01	0.02
Hydromorphone (Dihydromophinone, Dilaudid)	0.01	0.02
Morphine (Duramorph, MS Contin, Roxanol)	0.01	0.02
Oxycodone (Oxycontin, Percocet, Roxicet, Roxicodone, Tylox)	0.01	0.02

Analyte	**Blood** Lower Limit of Quantitation (mg/L)	**Urine** Typical Lower Limit of Reporting (mg/L)
Oxymorphone (Numorphan)	0.01	0.02
6-Acetylmorphine (Heroin metabolite)	0.01	0.01
Propoxyphene (Darvon, Darvocet, Dextropropoxyphene, Dolene, Propacet)	0.02	0.02
Bath Salts		
Mephedrone	0.02 (qualitative)	0.02
Methylone	0.02 (qualitative)	0.02
Benzylpiperazine (BZP)	0.02 (qualitative)	0.02
3,4-Methylenedioxypyrovalerone (MDPV)	0.02 (qualitative)	0.02
Flephedrone	0.02 (qualitative)	0.02
α-Pyrrolidinovalerophenone (α-PVP)	0.01 (qualitative)	0.01
Volatiles		
Acetone	0.01 g/dL	0.01 g/dL
Ethyl Alcohol	0.01 g/dL	0.01 g/dL
Isopropanol	0.01 g/dL	0.01 g/dL
Methanol	0.01 g/dL	0.01 g/dL
Toluene	---	---
Others		
Diphenhydramine (Benadryl)	0.02	0.02
Gamma-Hydroxybutyrate (GHB sodium oxybate, Xyrem)	5	10
Ketamine (K, Ketaset, Ketalar, Special K)	0.01	0.02
Methadone (Amidone, Dolophine, Methadose)	0.02	0.02
Norketamine (Ketamine metabolite)	0.01	0.02
Phencyclidine (PCP, Sernylan)	0.01	0.01
Phenytoin (Dilantin)	0.1	0.1
Psilocin	0.01 (qualitative)	0.01
Zolpidem (Ambien)	0.0025	0.0025

Links for the following Toxicology references:

- State of Minnesota Blood Specimen Collection Instructions
- State of Minnesota Urine Collection Kit Instructions
- Medical Personnel Certificate
- Approved and Certified Laboratories for the Forensic Analysis of Ethyl Alcohol

10.3 Trace Evidence
Trace-Micro

The Trace-Micro section makes comparisons to determine if there is a similarity between known and unknown samples of tape, glass, paint, fibers, and other materials. Instruments that may be utilized in some or all of these examinations include Fourier Transform Infrared Spectroscopy (FTIR), scanning electron microscopy-energy dispersive spectrometer (SEM/EDS), pyrolysis gas chromatography (PGC), microspectrophotometery (MSP), glass refractive index measurement (GRIM3), and microscopic examinations. Instruments utilized will be stated in the results section of the trace-micro report. Other examinations in the trace-micro section include the comparisons of shoeprints and tire tracks, filament determination for on/off status as well as physical matches of broken or torn objects.

1. Ensure samples are dry and are adequately protected from damage (e.g. plaster shoeprint case; consider if it would survive a fall or were inadvertently stepped on).

2. Ensure samples of trace evidence are not leaking (e.g. paint or glass samples) by tape sealing all package corners or placing each sample inside a leak-proof container (plastic bag, plastic box, etc.) and sealing. Care must be taken when placing multiple items into containers. Make sure all corners and seams of bags or envelopes are completely sealed before placing multiple items into containers. Trace evidence can easily leak out and be lost or contaminate other evidence through small openings in bags and/or envelopes.

3. Protect CDs. They should be adequately protected to survive heavy evidence placed on top of them or a person accidentally stepping on it.

4. Be diligent about accurately and completely labeling known and unknown samples and the area the sample was removed from. (Example: Paint smears removed from RF fender of the (Victim's name) vehicle, MN license # ABC 123).

    a. Known – can be assigned to a source.
    Examples:
        i. Glass collected from the broken window.
        ii. Paint collected from the non-damaged area of a vehicle.
        iii. Paint from a door frame.
        iv. A roll of duct tape.
        v. Trash bags still on the roll or in the box.

vi. Hairs removed directly from an individual's body.

b. Unknown – the original source is NOT known.
   Examples:
   i. Glass or paint collected from clothing or shoes.
   ii. Paint, glass, or insulation on a tool.
   iii. Paint smear on car/bike/building from a hit and run.
   iv. Paint from damaged area of vehicle.
   v. Duct tape used to bind victim.
   vi. Tape used in an explosive device.
   vii. Trash bag found on the body.
   viii. Hairs tape-lifted from clothing.
   ix. Foreign hairs on a body.

5. In a hit and run case involving two vehicles – at least four samples should be submitted:
   a. Known from victim's car near the damage.
   b. Unknown paint from the victim's car in the damaged area.
   c. Known paint from the suspect's car near the damaged area.
   d. Unknown paint from the suspect's car in the damaged area.

   More known paint should be submitted if more than one area is damaged since hood, doors, fenders, etc. can have different paint chemistry even on the same vehicle.

6. The use of tape lifts is acceptable for unknown samples of fibers and hairs, but is discouraged for paint samples. The paint sample should be collected by scraping down to the metal onto a small piece of paper and folding with a druggist fold and enclosing this in a labeled tape-sealed envelope (all seams sealed).

7. In general, the Trace-Micro section requires a known sample along with the questioned material.

The next few pages include a helpful table listing collection and packaging guidance for a variety of Trace-Micro evidence specimens.

Specimen	Amount to Take Standard/Known	Amount to Take Evidence/Unknown	Wrapping & Packaging	Remarks
Broken Parts (Physical Matches)	Entire broken part.	All broken parts.	Protect from further breakage and damage. Place in a sturdy container.	Some of the best evidence, yet it is often overlooked.
Clothing	-	All	Place each item of clothing in a separate clean brown paper bag.	Avoid the use of plastic bags. Air dry wet items before packaging. Use caution in handling.
Fabric Impressions	All outer clothing.	Object the impression is on.	Protect the impression against loss through abrasion.	Photography of a fabric impression is very difficult.
Fibers	All outer clothing.	All fibers.	Place in a "druggist fold" or inside a folded yellow "Post-It," then inside an envelope with all seams taped closed.	Fingers or tweezers are best. Tape lifts are acceptable. Vacuumings only as last resort.
Hairs	25 - 50 ***pulled*** hairs from head and pubic area (packaged separately and labeled).	All	Place in a "druggist fold" or inside a folded yellow "Post-It," then inside an envelope with all seams taped closed.	A good known sample consists of hairs from all areas of the head/pubic area.
Glass	At least 1 square inch from each broken window (take from frame - not from the ground).	All	Use pillboxes, film canisters, cardboard boxes, etc. Keep each source separate.	Be aware of possible shoeprints on broken pieces. All pieces should be submitted for attempt of a physical match.

Specimen	Amount to Take Standard/Known	Amount to Take Evidence/Unknown	Wrapping & Packaging	Remarks
Headlights and Tail lights		Headlight(s), tail lights	Place in a sturdy container and protect from further damage (use styrofoam cups to protect filament area).	All information regarding incident is helpful. Photographs of damamged area on vehicle is useful.
Paint	Size of a penny, including the primer layer, from each potential area of impact on each vehicle.	All	Use pillboxes, film canisters, etc., or a druggist fold inside an envelope with all the seams taped.	Do not use tape or plastic bags to collect. Make sure the full thickness of paint is taken.
Shoeprints	All suspect footwear	All. Submit photos, negatives, and casts.	Submit the actual shoeprint (e.g. print on sheet of paper) if at all possible. Fasten the print to the bottom of a box so nothing will rub against it.	A careful search for shoeprints should always be conducted. Good photographs including a scale (ruler) should always be taken.
Tape	Entire sample or roll	Entire sample	Paper bag or box with sticky side up. Sticky side may be adhered to a clean glass slide.	Avoid putting sticky side on any type of plastic.
Tire tracks	Tires from the suspect vehicle	"Best" area of all four tire tracks, if present. Submit photos, negatives, and casts.	Reinforce casts, dry, and cushion in a cardboard box.	Photograph with scale (ruler) prior to casting. If possible, submit actual vehicle. Leave tires on rims.

Specimen	Amount to Take Standard/Known	Amount to Take Evidence/Unknown	Wrapping & Packaging	Remarks
Tools		All	Protect the area of interest from loss or alteration (e.g. sandwiching between cardboard) and seal in a sturdy container.	Make certain that suspect tools are not in contact with scene samples.

Additional Notes:

- Information concerning a case should be submitted with the evidence.
- Each item of evidence should be marked for identification.
- Known and unknown items must be packaged separately.
- Containers need to be sealed and marked (tape seal all seams and sign initials across the seal with a permanent pen).
- All photographs of fabric impressions, tire tracks, shoeprints, etc. should contain a scale (ruler) and be taken with the film plane parallel to the object.
- Photographs should be submitted.
- In general, avoid the use of plastic bags as evidence containers.

Trace-Chemical Testing

The Trace-Chemical Testing section analyzes fire debris samples via gas chromatography mass spectrometry (GC/MS) for the presence of ignitable liquids that may have been used to start or accelerate a fire. The examinations performed are based on applicable ASTM International guidelines for sample extraction, preparation and analysis. This section also analyzes chemical unknowns: non-narcotic, non-biological materials of evidentiary value. Identification, characterization and/or comparison of these materials is accomplished by the examination of physical properties and/or using analytical instrumentation such as, but not limited to GC/MS, FTIR, and scanning electron microscope - energy dispersive spectrometer (SEM-EDS).

The collection, preservation and timely transmittal of fire debris evidence are important steps in the investigation of possible arson fires. When submitting fire debris or chemical unknowns to the laboratory, use the following guidelines:

NOTE: Prior approval from the Trace Group Supervisor and/or Directors is required for all non-fire debris cases.

1. Fire debris evidence packaging – unused lined metal paint cans with tight fitting friction lids.

    a. Quart and gallon cans are preferred, but any size can be used. Keep in mind, the amount of evidence to be collected will determine the size of the can used.
    b. Lined cans are preferred because unlined cans will rust through in a matter of weeks (even days, in some cases).

Fig. 10.3- 1: New and clean paint-like lined metal cans with tight fitting friction lids are available from paint wholesalers. It is beneficial to have an assortment of sizes on hand to ensure proper evidence packaging.

2. Liquid Samples – use glass bottles up to one ounce maximum in size with Teflon lined screw caps and secure against breakage during transport.

3. Original Containers (such as gas cans)

    a. Liquid samples only – sample as for liquid samples in #2 above, secure and retain the container and remaining liquid.
    b. Containers – analysis only (such as for latent prints):
        i. Intact Container – transfer liquid to another suitable container and retain separately. Then, air-out and seal openings of the questioned evidence with the original cap(s).
        ii. Ruptured and cap-less containers – transfer liquid to another suitable container and retain separately. Air-out the questioned evidence container.
    c. Both liquid and container analysis – submit two separate samples as described in 3a and 3b above and retain the excess liquid in another suitable container.

4. When Collecting Arson Evidence
    a. Collect samples that are only partially burned.
    b. Collect separate samples of the same material from an area that has been protected from the fire (Comparison Sample).
    c. Absorbent materials are better than non-absorbent materials.
    d. Generally, the larger the sample the better.
    e. Only fill the container half full.
    f. The size of the sample determines the size of the container.
    g. Soil samples must be kept frozen from the time of collection to the time of analysis.

5. Practices to Avoid
    a. Do not package samples in paper bags unless serology examinations are required (DNA).
    b. Do not package samples in regular plastic bags. Nylon bags are acceptable, but always submit a heat-sealed control bag for comparison.
    c. Do not submit leaking containers (if the outside is wet or you can smell petroleum products, the evidence is not packaged properly).
    d. Do not submit large quantities of ignitable liquids (maximum is one ounce).
    e. Do not submit more than one case per package – each case packaged individually.

6. Label each container with the following information:
    a. Agency Case Number
    b. Exhibit Number
    c. Date of Collection

d. Investigator's Name or Initials
e. Contents of Container
f. Location where evidence was collected
g. Address of Incident
h. Name of victim and/or suspect

7. Include the following information with the evidence when it is submitted:

a. Name of the suspect, owner and/or victim.
b. Essential case facts (e.g. time and date of occurrence, type of structure, whether or not occupied, etc.)
c. Agencies and officials to whom the report should be sent and evidence returned.
d. With chemical unknowns, it is critical that information concerning what may be suspected based on case circumstances is given to the laboratory (e.g. chemical exposure, biological exposure, poison, victim's symptoms, etc.).

Any further questions you may have in regards to fire debris or chemical unknowns, please contact the Chemical Testing Section.

10.4 Biology

Nuclear DNA

The Biology section conducts several types of serological examinations on evidentiary materials, including the indication of blood, seminal fluid, saliva, and urine and the identification of semen. Serological examinations may consist of color tests (blood, semen, saliva and urine), immunological tests (blood and semen) or microscopic examinations (semen). Additionally, biological material such as hair, tissue and skin cells may be collected from evidence.

Nuclear autosomal and Y-chromosome STR (short tandem repeat) DNA testing using capillary electrophoresis is then performed in order to determine possible sources of the biological samples. This involves comparing the DNA types obtained from the questioned stains with the DNA types obtained from known blood and/or saliva samples from victims and suspects. Bloodstain pattern interpretation at crime scenes and on a variety of items collected from crime scenes (e.g. clothing, weapons, etc) can also be requested.

Nuclear DNA analysis is also conducted on biological samples collected from unidentified human remains and known samples collected from relatives of missing persons. DNA profiles obtained from unidentified human remains are uploaded to the National Missing Persons DNA Database to be compared to DNA samples submitted by relatives of missing persons.

Evidence Collection

DNA can be retrieved from several sources. Biological fluids such a blood, semen, and saliva are great sources. It is important for the DNA testing process that evidence is collected properly. For example, when collecting a swabbing from items such as pop cans, please use sterile water and collect two swabs. One half of the sample will be tested and the other half will be preserved for possible testing by defense counsel. Also, when labeling items of evidence, please take note that buccal swabs are inner cheek swabs. Please do not use buccal to describe swabbings taken from evidence as this may cause confusion as to what precisely the swabbing is from.

Biological Evidence Collection Guidelines

Type of Evidence	Collection Guidelines
Wet Stains	Collect the entire item. -or- Cut the stain out of the item. -or- Swab the stain using one or two sterile swabs.
Dry Stains	Collect the entire item. -or- Cut the stain out of the item. -or- Wet one to two sterile swabs with distilled water. Swab as much of the stain as possible using these swabs. -or- Scrape the stain onto a piece of paper. Fold the paper to contain the scrapings and tape all edges (this method is not preferred).
Hairs	Collect entire item or portion of the item that contains the hair. -or- Use disposable tweezers to collect hairs into a paper envelope. -or- Collect hairs using a tape lift (this method is not preferred).
Fingernails	Use a toothpick to scrape under nails of each hand. Collect scrapings and the toothpick. -or- Collect nail clippings from each hand. -or- Swab each nail on both hands with a separate sterile swab moistened slightly with sterile or distilled water (this method is not preferred).
Other Items	Collect entire item or portion of item. -or- Swab using one to two sterile swabs moistened slightly with sterile or distilled water.

Evidence Packaging and Storage

The proper collection, packaging and storage of an item are essential to obtaining the greatest evidential value from its examination. For biological items, please be sure that wet items are allowed to air dry. Dry items should be kept dry. Once dry, package them into tape sealed brown paper bags, manila envelopes, or cardboard boxes. Never package in plastic (except for organs and large amounts of liquid and tissue).

Use packaging that is larger than the item. Do not roll a bag around itself to tape seal it further. Allow the item room to breathe.

Items found together should be packaged together. Use separate packaging for items not found together. Package all items carefully to prevent stain transfer or evidence damage. For knives, guns, glass, and similar items, secure item in a cardboard box for safety. For hairs, fingernail scrapings/clippings, and other trace evidence, package in an envelope and tape seal all corners and edges.
Refrigerate evidence as soon as possible. Temporary room temperature storage is usually okay for most items of evidence. Tissues and organs should always be kept frozen. Never expose DNA evidence to intense heat or sunlight. Submit the evidence as soon as possible.

Consider that you may be a potential source of contamination. Therefore, it is crucial that individuals who are handling evidence wear latex or nitrile gloves. Make sure to change gloves between handling different items of evidence.

Before collecting the evidence, think about the circumstances of the case; who was bleeding, the location of the incident, how many individuals were involved, etc. All of these factors will influence what should be collected. Other information required for the laboratory to determine the types of analysis needed include:

1. Is there a suspect?
2. Is clothing available (if not submitted)?
3. Was the victim or suspect bleeding?
4. Did the victim have consensual intercourse within 72 hours prior to the exam and sample collection, if so; a known biological control sample will be required from that partner.
5. Was the victim hospitalized, in a coma, transfused, if transfused, is it possible to get a type-and-cross match tube of blood?
6. Is the victim a child or vulnerable adult?

Be as descriptive as possible in regards to the item of evidence when labeling the outer packaging. Evidence should be grouped the following way:

- Known samples (kits) - BCA must have known samples from victim.
- Victim's clothing.
- Suspect's clothing.
    - In sexual assault cases, suspect's clothing will be examined last unless blood from the victim is suspected to be present. There is not a presumptive test for vaginal secretions therefore, when no blood or semen is present on the clothing, general DNA testing will be performed only if no other probative information has been obtained in the case.

Burglaries and Robberies

In order to assist the laboratory to more easily assess the urgency of incoming cases, where possible, indicate if it was just a property crime or whether it involved:

- Home invasion.
- Bodily Harm.
- A threat of bodily harm.

Firearms will not be accepted for the sole purpose of inclusion into the DNA Database.

- If you believe that an attempt to preserve possible DNA evidence for future testing should be made, swab the firearm prior to submission to the laboratory and retain the swabbings and submit them when known suspect samples have been obtained.

- If you need to request an exception to this policy, you must contact the Nuclear DNA Section Supervisor prior to submitting the evidence.

Paternity Testing

- The Minnesota BCA Forensic Science Service does not do paternity testing unless a criminal sexual assault is involved.

Links for the following Nuclear DNA references:

- BCA Known Sample Collection Kit (005-EV)
- Patient Information and Sexual Assault History Form (013-EV)
- Offender Sample Sheet for DNA Database and Buccal Swab Collection Kit Instructions (014-EV)

CODIS

STR DNA profiling is performed on convicted offender samples submitted by law enforcement agencies and correction facilities, as mandated by the Minnesota legislation.
The DNA profiles are imported to the State DNA Index System (SDIS) database, and then searched against DNA profiles obtained in unsolved criminal cases. Convicted offender DNA profiles are also uploaded to the National DNA Index System (NDIS) database for searching against DNA profiles uploaded by other states. SDIS and NDIS are two components of the Combined DNA Index System (CODIS). Searches are also performed to compare casework DNA profiles with other casework profiles.

It is the policy of the MN BCA FSS that samples (blood or saliva) collected for the sole purpose of inclusion in the national Combined DNA Index System (CODIS) database are not acceptable as evidentiary samples to be used as reference samples in casework. The MN BCA FSS will proceed with a case if reference samples are not submitted along with the evidentiary items to attempt to develop a DNA profile. If such a profile is developed, a search of the convicted offender DNA database can be performed. If a convicted offender is identified as a possible contributor (database match), testing of the true reference sample from the convicted offender must be tested before any report can be sent as to the significance of this match (random match statistics). Therefore, it is desired that all reference samples be obtained for DNA testing for reporting purposes and case expediting. All non-suspect cases are processed without reference samples.

Links for the following CODIS references:

- Offender Sample Sheet for DNA Database and Buccal Swab Collection Kit Instructions (014-EV)

Mitochondrial DNA (mtDNA)

The Mitochondrial DNA Unit of the Biology section conducts mitochondrial DNA (mtDNA) analysis on evidentiary materials that are typically unsuitable for nuclear DNA analysis. These materials include hair, teeth, and bone. The extraction of mtDNA is followed by amplification of the control region (HV1 and HV2) using the polymerase chain reaction (PCR). The amplified mtDNA is then quantified and sequenced using capillary electrophoresis. The mtDNA types obtained from evidentiary materials are then compared to the mtDNA types obtained from known blood and/or saliva samples from victims and suspects. The Mitochondrial DNA Unit also processes samples for entry into the National Missing Persons DNA Database. These samples include those collected from unidentified human remains and known samples collected from relatives of missing persons.

Submitting Evidence for mtDNA

1. Contact the MN BCA FSS for prior approval and to begin the evidence submission process. Evidence can be submitted by U.S. Mail, delivery service, or delivered in person.

2. All evidence must be delivered in a sealed condition. Your agency will be contacted if unsealed evidence is received or if the seals appear to have been tampered with. Each item should be clearly marked to describe the contents.

3. For cases involving missing persons and/or unidentified human remains, in addition to the information required under Section 9.0. of this manual, refer to the National Missing Persons DNA Database (NMPDD) supplemental instructions listed on the following page.

4. Comparative hair examinations require pulled hair reference samples from all involved principals. Twenty five pulled hairs should be collected encompassing all areas of the head and/or pubic region. If this type of examination has already been completed for the submitted case, a copy of the lab report(s) should be provided to the MN BCA FSS.

5. All bones must be examined by a forensic anthropologist prior to submission; all teeth must be examined by a forensic odontologist prior to submission (contact the MN BCA FSS for information on independent testing laboratories). A copy of their report(s) should be provided to the MN BCA FSS.

6. All attempts will be made to keep your agency informed as to when a report can be issued. If there are known time constraints, e.g. trial date, investigative needs, etc., please make sure that these are communicated to the MN BCA FSS.

7. Your agency will be notified if it becomes necessary to fully consume evidence samples during testing which may preclude future analysis. It will be necessary to obtain your written permission prior to continuing with the testing of these samples.

NMPDD Supplemental Submission Requirements

The following information is required for the submission of samples for the purpose of upload to the National Missing Persons DNA Database (NMPDD). These requirements are in addition to the primary instructions for submitting evidence to the Biology section.

1. A direct reference sample from the missing person needs to be submitted when possible. Examples of this type of sample would be a toothbrush, razor, tissue biopsy, newborn screening, bloodstain, etc.

2. When submitting samples from relatives of missing persons, it is recommended to submit a minimum of two relatives. The inclusion of at least one maternal relative and if the

missing person is male, one paternal relative. Please contact the biology section if there are specific questions regarding samples to submit. The following information is required for direct reference samples and samples collected from relatives of missing persons:

a. NCIC number assigned to the missing person (MP) case.
b. Completed consent forms for each relative submitting a sample (these forms can be obtained from the MN BCA FSS upon request).
c. Relationship to the MP (e.g. mother, maternal grandmother, half-brother, etc.)
    i. NOTE: If the sample is from a half-sibling, please include specifics regarding which parent is shared.
d. Case specifics, to include:
    i. Gender, Date of Birth (DOB), Height, and Race of MP.
    ii. Date of last contact and last known location.
    iii. Identifying features (e.g. scars, marks, tattoos, etc.).
    iv. Medical anomalies (e.g. metal rods, artificial hip, etc.).

3. Samples obtained from unidentified human remains (UHR), tissue samples, or bones with adhering tissue should be submitted frozen. The following information is required for UHR samples.

    a. NCIC number (if assigned).
    b. Type of sample being submitted, as well as information regarding the availability of additional samples from the UHR (including teeth).
    c. Case Specifics to include the following (if available):
        i. Gender, age range, height range, and race of UHR.
        ii. Date and location of UHR discovery.
        iii. Estimated time since death.
        iv. Identifying features (e.g. scars, marks, tattoos, etc.).
        v. Medical anomalies (e.g. metal rods, artificial hip, etc.).
        vi. Were the remains a full or partial body? – What was missing?

Links for the following Minnesota Missing Person's DNA Project references:

- Minnesota Missing Person's DNA Project-Instructions (009-EV)
- Minnesota Missing Person's DNA Project-DNA Consent Form (007-EV)
- Minnesota Missing Person's DNA Project-Family Information Form (008-EV)
- Minnesota Missing Person's DNA Project-Evidence Tracking Form (010-EV)

10.5 Firearms and Toolmarks

The Firearm and Toolmark section conducts many types of firearms examinations: whether a questioned bullet or cartridge case was fired from a suspect firearm; the caliber and type of firearm possibly used to produce fired bullets and cartridge cases when no firearm has yet been recovered; the proximity of the firearm to the target material (with a visual examination and using chemical tests for copper, lead and nitrites); ejection pattern analysis; whether a firearm is functional; and whether submitted ammunition is a commercial load or reload. The section also maintains a National Integrated Ballistic Information Network (NIBIN) database which links firearms evidence from different crime scenes.

In addition, the section works with toolmarks to determine whether an evidentiary toolmark matches a recovered tool, the type of tool that may have been used to produce a toolmark, and whether a lock is in working order or how it may have been compromised. Serial number restorations on various item types are also performed using chemical reagents or ultrasonication to etch the base material.

Firearms

Fig. 10.5- 1: Firearm securely fastened to packaging with a zip-tie through the action.

Firearms and fired ammunition may be delivered to the laboratory in person or through the mail. With very rare exceptions (e.g. rusted or damaged firearms), all firearms submitted to the laboratory must be unloaded. It is preferred to have the firearm packaged in a manner that it is clearly unloaded, typically with a zip-tie through the action.

Most firearms examinations are comparative. Therefore, the firearms examiner must have two things to compare, such as a fired bullet to a gun, a powder pattern to ammunition, etc. That means if the evidence isn't collected with a thought to the comparison aspect, there is little that can be done with the evidence.

Generally firearms evidence is relatively strong and not easily damaged by routine handling. However, since firearms related evidence may also be examined by other laboratory sections, the

evidence must be handled and packaged according to the most fragile evidence it contains. For example, if a firearm is to be examined by the Firearms section only, no special handling or packaging is required other than a tape-sealed initialed container. However, if that same firearm is to be examined for the presence of hairs, blood, fingerprints, etc., the handling and packaging requirements of other laboratory sections will dictate how the firearm must be handled and packaged.

As with any other evidence, firearms related evidence must be marked for later identification by the person collecting it. Use common sense in the packaging and marking of firearms related evidence. For example, don't mark a fired bullet on its side where the rifling marks are located. If evidence is too small to mark, place the evidence in a package then seal and mark the package.

A firearms examination is conducted last. If other sections need to conduct an examination on the firearms related evidence, make sure this is clearly indicated in your submission paperwork. If the Firearms section conducts its examination first, other examinations may be negated because the other evidence may be destroyed during routine firearms examination.

Firearms or Other Metal Evidence Recovered from Water/Liquid

Firearms or other metal evidence recovered from water/liquid must be packaged immediately in the water in which it was located. Ensure that the item of evidence is completely submerged in the liquid. This will slow the oxidation process and limit the amount of change to the evidence prior to analysis.

Gunshot Residue Information

Generally the Firearms section only examines bullet-hole bearing materials for gunshot residue. This means the Firearms section does not examine the suspect's clothing for powder particles because it cannot be related to the shooting incident under investigation. However, under certain circumstances, it may be necessary for these examinations to be performed. These circumstances are when there is obvious gunshot residue on the suspect's clothing or victim's bedding. For residues to be there, the firearm must have been either in contact with the material or in close proximity to the material at the time of discharge.

The only clothing needed by the Firearms section is that which bears a bullet hole. For example, if the victim was shot in the chest, there is no reason to submit the pants, shoes, socks, etc., for a firearms examination.

Gunshot residue located on clothing is easily dislodged, so treat it accordingly. Additionally, gunshot residue, being high in nitrogen compounds, is easily destroyed by bacterial action. Therefore, if it is wet, hang it up to dry prior to packaging. It must be treated gently or the gunshot residue can be easily dislodged. Package the clothing in brown paper bags, not plastic bags.

Primer Gunshot Residue Labs

The Firearms Section does not currently conduct examinations of evidence for primer gunshot residue (GSR) and does not accept GSR kits submitted for examinations. This examination involves the analysis of samples, typically collected from the hands of individuals for the presence of primer GSR with the intent of linking an individual to a shooting incident. This examination is different from proximity determination analysis which is based on observed patterns of GSR around apparent projectile holes. This is an analysis the Firearms Section does perform.

The MN BCA FSS will provide information on independent testing laboratories offering primer GSR analysis upon request. If you have questions, please contact the Firearms Section of the laboratory or the Crime Scene Team Leader who processed your scene.

Fired Cartridge Case Location to Determine Shooter Position

In order to perform this examination, the following information and evidence needs to be submitted to the laboratory:

1. Photographs of the scene.
2. An accurate sketch of the scene showing cartridge case locations, furniture, etc.
3. A description of the floor.
4. The height of the shooter.
5. A description of how the firearm was held during the shooting incident.
6. A statement as to who had access to the scene and whether or not the cartridge cases could have been or were kicked out of position prior to being located within the scene.
7. The firearm and ammunition used during the shooting incident.
8. The position/location of the victim during the shooting incident.

Evidence for NIBIN (National Integrated Ballistic Information Network) Entry

Fig. 10.5- 2: Scientist at NIBIN terminal.

1. If evidence is for NIBIN entry, state what the original offense charge was. Typical case types for NIBIN entry requests include weapons violations, assault, burglary, attempted homicide or homicide, death investigation, robbery, controlled substance, clandestine laboratory, found property, and drive-by-shootings. If the firearm may be stolen from a state other than Minnesota please inform MN BCA FSS of the state.

2. Evidence suitable for entry into the NIBIN database include:
    a. Fired cartridge cases.
    b. Semiautomatic handguns.
    c. Military-style semiautomatic rifles.
    d. Shortened/cut down rifles and shotguns.

3. Evidence generally not suitable for entry into the NIBIN database include:
    a. Bullets.
    b. Revolvers.
    c. Derringers and single-shot pistols.
    d. Full length sporting/hunting type rifles and shotguns.

Evidence not accepted and/or analyses not performed by the BCA Firearms section:

- Gunshot Residue Kits.
- Explosives.
- Cannot determine the time since the gun was fired.

Link to Firearms references:

- Firearms NIBIN Database Entry Request Form (011-EV)

Toolmark Evidence

1. Photograph the toolmark showing its location in the scene. Make note of how the tool must have been used in order to make the mark. Remove the mark from the scene, mark and package it properly.

2. If the toolmark cannot be removed from the scene, make a cast of the toolmark using a silicone based casting material.

3. Package any seized tools such that the area which had to have been used to make the toolmark is protected from further contact with other objects. For example, the handle of the screwdriver need not be protected but the bladed end must be protected.

4. When collecting the tools for a toolmark examination, consider that a trace evidence examination (paints etc.) may be required. This means that the appropriate trace evidence known must be collected or the area needs to be protected from loss or alteration.

10.6 Questioned Documents

The Questioned Documents section offers examination services in the areas of signature, handwriting, and hand printing comparisons; typewriter comparisons; indented impressions; inks; papers; mechanical impressions; photocopier comparisons; computer printer comparison; alterations and obliterations; reconstruction of documents that have been burned or otherwise damaged; and the identification of counterfeit documents.

NOTE: Prior approval from the Trace Group Supervisor and/or Directors is required for all cases requiring examination by the Questioned Documents section.

Indented (impressions) writing may be visualized using sidelight or the Video Spectral Comparator (VSC) and lifts of the impressions are developed utilizing the Electrostatic Detection Apparatus (ESDA).

Examinations of inks, papers, indented impressions, security features, and other evidence may be examined using the Video Spectral Comparator (VSC).

Questioned v. Known:

In order for the Questioned Document Examiner to investigate whether a linkage exists between a victim and a suspect, it is imperative for our clients to collect the correct known and unknown evidence samples. For instance; if a questioned document bears upper and lower case printing, comparable words, letter combinations and/or numbers should be collected from a suspect by asking him/her to write in upper and lower case printing.

Group questioned document evidence according to the following:

- Questioned.
- Known – requested.
- Known – non-requested.

Packaging:

Evidentiary documents need to be handled carefully and precautions must be taken to avoid contamination of the evidence. Non-cotton gloves such as latex, vinyl, or nitrile should be worn when collecting and packaging documents. Do not handle documents with tweezers or like devices. Do not fold, staple, or tape anything onto document evidence.

1. Documents should be packaged separately in an appropriately sized envelope (preferably manila) and all seams sealed. Mark the packaging with any identifying information BEFORE placing the document inside. Avoid the use of plastic bags as they do not breathe and could foster mold and bacterial growth; greatly hindering analysis.

2. Fragile documents and documents intended for indented writing examinations can be protected by placing them between two pieces of cardboard before packaging them into an envelope, box, or paper bag. Tape all seams of the outer container. If any of the fragile document evidence has been charred, shredded, water-soaked, or is water-soluble paper, contact the Questioned Documents Section immediately for instructions.

3. Evidence that has been exposed to moist environments (especially biological fluid) needs to be air dried before packaging. The outer package should be marked as possibly containing a biological or hazardous material.

4. Questioned document examinations should be done before evidence is processed for latent prints.

5. When questioned writing appears on surfaces that cannot be brought into the laboratory, photographs need to be taken using oblique lighting and should include a ruler for scale. Whenever possible, take photos from a perpendicular position (90 degree angle). CDs containing digital images including dates and times can be submitted as evidence.

Additional information requested by the Questioned Document Section:

- Include the date the known writing was collected in reference to the questioned writing.
- Include the ages of the writers involved.

Links for the following Questioned Document references:

- BCA Handwriting Exemplar Form-Guidelines for Obtaining Known Handwriting Standards (004-QD)
- Possible Sources of Non-request Writing

10.7 Latent Prints

The Latent Print section compares unknown friction ridge impressions with known exemplars and renders a conclusion of identification, exclusion, or inconclusive. The process is a quantitative and qualitative examination of the ridge detail present and is known as the ACE-V method. ACE-V is an acronym for analysis, comparison, evaluation and verification. The section utilizes an Automated Fingerprint Identification System (AFIS) to search unidentified friction ridge impressions in the databases of the Midwest Automated Fingerprint Identification Network (MAFIN) and the FBI Integrated Automated Fingerprint Identification System (IAFIS).

The section also analyzes adhesive, porous, non-porous, semi-porous and blood contaminated evidence for the presence of friction ridge impressions. This is done with the application of powders, dye stains, cyanoacrylate fumes, chemicals and blood enhancing reagents. Examinations are made utilizing lasers, alternate light sources, photography and digital imaging.

In order for the Latent Print section to best serve your needs, the following information or evidence must be obtained:

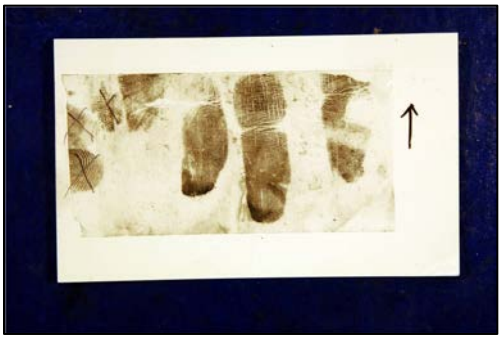
- When a principal is provided in a case, please provide the following:
    - Full Name
    - Date of Birth (DOB)
    - Minnesota SID Number (State Identification) and FBI number
        - NOTE: If a SID cannot be provided at intake, submitting agencies are encouraged to provide one to the laboratory as soon as possible. If a Minnesota SID number or FBI number does not exist for an individual, the submitting agency will need to provide a fingerprint card.

- Elimination prints from the victim should be obtained
    - Example - 1: in residential burglaries – the prints of the homeowners should be provided.
    - Example - 2: in auto thefts – the prints of the vehicle owner and/or the primary driver should be provided.
    - Failure to provide elimination prints will affect whether or not a latent print is entered into the MAFIN Unsolved Latent File (ULF).
        - NOTE: The fingerprints of police officers, firefighters, and EMS technicians are not stored in the MAFIN database and elimination prints from these individuals should be provided if the evidence was handled without gloves.

- For burglary cases, denote if it is residential or commercial.

Packaging evidence is an essential part of preserving latent prints. Prints on non-porous surfaces are fragile; if care is not taken when packaging items, latent prints can easily be destroyed. If possible, it is recommended that these surfaces be processed at the scene.

Fingerprint powder and tape lifts are still one of the most effective methods of preserving latent prints at crime scenes. All lifts can be placed in a single envelope as one item and sent to the lab. Remember to properly document important information on the lifts, including when and from where the latent prints were recovered, including an orientation mark.



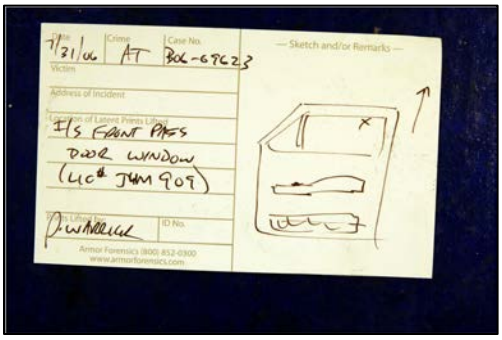


Fig. 10.7-1 and 10.7-2: Example of a print lift with lifts on the front (left) and information about the lifts on the back (right).

When packaging non-porous items for submission, they should be placed in paper bags or cardboard boxes. Care should be taken so that the items are subjected to minimal movement against the sides of the container or other items in the container, otherwise latent prints can be damaged or destroyed.

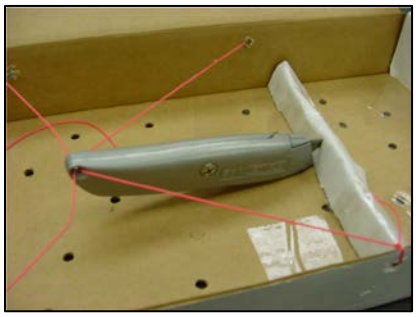


Fig. 10.7-3, 10.7-4 and 10.7-5: Examples of packaging non-porous items for submission to the laboratory.

Porous items may be packaged in paper or plastic envelopes, and multiple objects may be packaged together. Make sure these items are dry prior to packaging. Do NOT write on the envelope after packaging. This will affect any possible indented writing exams performed on documents.

The following are some helpful latent print submission and packaging guidelines. Keep in mind that this is not an all-inclusive list. If you have questions or need further direction, do not hesitate to contact someone from the latent print section.

- Known exemplars from multiple individuals should be submitted separately.

- Evidence that has been processed should include information on the types of processing used (e.g. superglue, fingerprint powder, etc.).

- Drug packaging should be separated from the controlled substance. If it isn't possible to separate (e.g. trace residues), write LATENT PRINT PROCESSING REQUESTED on the outermost packaging (not the packaging that will be processed for latent prints), the item will go to the Drug Chemistry section first.

- Items submitted for both latent prints and DNA should not be refrigerated or frozen.

- Agencies are encouraged not to submit large items such as doors, windows, safes, etc. to the laboratory. Instead, powder and submit lifts only.

- Submit any images of latent prints that were captured. The images should include a scale and orientation mark.

- For paper evidence (porous surfaces) – Is there any possibility of indented writing or the need for Questioned Document analysis? If yes, this analysis must be completed before any latent print processing.

- Please lift all the latent prints in what appears to be a simultaneous impression (multiple fingers depositing residue at the same time on a surface) even if some of the latent prints appear to have no ridge detail present. Lifting the adjacent latent prints will help with digit determination (e.g. right middle or left ring finger) and can increase the likelihood of making an identification, whether it is from comparing to known exemplars or being searched in the AFIS databases.

- Black or white fingerprint powder will work best in the vast majority of cases when processing non-porous surfaces for latent prints. Normally there is no need to use bi-chromatic or fluorescent powder.

10.8 Crime Scene

Both the St. Paul and Bemidji facilities have a mobile Crime Scene unit that provides on-site crime scene processing support services to all Minnesota law enforcement agencies, when requested. The Crime Scene Team will respond for assistance in cases were there has been a violent crime against a person and that person is not able to immediately or effectively aid investigators in the investigation. Typically, the Laboratory Crime Scene Team will respond to:

- Homicides
- Attempted Homicides
- Abductions
- Death Investigations
- Officer Involved Shootings
- Clandestine Grave Body Recoveries

The Crime Scene Team will not typically respond to:

- Burglaries
- Criminal Sexual Assaults
- Assaults

The Crime Scene Team will process vehicles that are brought to the Laboratory Garage by a law enforcement agency. Standard crime scene response criteria do not need to be met and can include any felony offense.

During crime scene processing, the team may search for various kinds of forensic evidence including but not limited to biological (e.g. blood and semen), latent print, trace (e.g. hairs, fibers, glass, paint, fire debris, shoe print and tire track impressions), questioned document, toolmark and firearms evidence. The Crime Scene Response Vehicle has all necessary supplies and equipment necessary to collect, preserve and transport physical evidence gathered at crime scenes. In addition, the team may interpret bloodstain patterns and reconstruct shooting scenes if the evidence supports such exams.