

Preservation of Exhibits in Medico-legal Cases

Forensic Science



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- Collection
- Packaging
- Preservation

Tissue -Collection

- Collect about 100 gm. of muscle tissue in a clean container and freeze immediately
- or keep in chilled saline protected with ice
- or keep the tissue in crystal salt and forward to the laboratory at the earliest.
- **Never preserve the tissue in formalin**

- Bones with attached tissues :

Preserve the **femur bone (if femur is not available, other long bones are preferred)** in a clean sterile bottle with crystal salt.

- Bones after the full loss of tissues :

Pack the dry **femur bone (if femur is not available, other long bones are preferred)** in clean paper and forward to the laboratory.

- Teeth : Pack 2 to 3 the molar teeth (if molar teeth are not available, premolar, canine or incisors can be used) in paper.
- Hair with root : Pack in a sterile bottle or envelope.
- Burnt bones/ fragments should be packed in box with layers of cotton pads.

Precautions to be taken while collecting samples

- Wear gloves when samples are collected
- Do not touch samples with bare hands
- Avoid contamination between samples
- Never pack wet samples- always dry stained items before packing.

- Avoid bottles and containers as far as possible when packing stained items. Always prefer clean paper.
- Never preserve samples in formalin
- Never pack more than one item in one packet
- Bring samples to the lab at the earliest.
- Contact Scientist in DNA Division for any clarifications

Blood Collection Cards

- used for room temperature collection, shipment, archiving, and purification of nucleic acids from a wide variety of biological samples for PCR analysis

Collection of DNA on cards

- Collection of DNA on cards is the easiest and most efficient way for long-term storage for future DNA testing.
- cards are one of the leading DNA preservation tools in forensic applications today.
- The majority of US states and many countries around the world use cards for the long-term storage of DNA from both blood and buccal cell sources.

- When archiving DNA for future analysis it is imperative that DNA be preserved and protected from chemical and environmental damaging agents in order to stabilize the nucleic acid.
- Cards have **chemically coated** matrix which preserve DNA more efficiently than untreated matrices.

- Cells in biological samples deposited on cards lyse on contact with the matrix and DNA is captured by the card.
- DNA is protected from environmental and enzymatic damage by the chemicals contained in the card.
- **Microorganisms are inactivated preventing DNA contamination and viruses are inactivated** making the samples safe to handle.

- Biological samples on cards are stored at room temperature so there is no need for freezers.
- Studies on blood samples stored for over 17 years and buccal cell samples stored over 8 years showed no sign of DNA degradation

- Sample collection on cards is quick and easy.
- Simply drop blood samples on the card and let it dry.

- Buccal samples are also easily collected using the EasiCollect™ device.

Autopsy Samples

- Preserved in **20%** Dimethyl Sulphoxide (DMSO) saturated with sod. Chloride.
- Alternatively, can be frozen in dry ice and sent to lab.
- Formaldehyde / **formalin should not be used for preservation.**

COLLECTION : LIQUID BLOOD

- Collect with clean (sterile), syringe or pipette/dropper and transfer to a clean (sterile) test tube.
- Blood clot : Use clean spatula to transfer to a clean test tube.
- Alternatively soak blood or blood clot on to clean cotton cloth, gauge, cotton swabs and air dry.

- Label the sample with case no., item no., date, time, location, and name of collector.

Note : Wet sample should be preserved in anti-coagulant (EDTA) and kept in refrigerator and sent to laboratory as soon as possible. Liquid samples can be preserved on cards also.

WET BLOODSTAINS

- Garments : Place on clean surface or hang up and allow to dry out of direct sunlight without any heat such as hair dryer.
- Objects/weapons :
 - If small, dry and pack as such.
 - If large, transfer blood stain onto clean cotton cloth, dry and pack.

DRIED BLOODSTAINS

Dry stain on weapon, garments and other movable objects - collect item separately.

DRIED STAINS ON NON-MOVABLE OBJECTS

- i) Photograph blood stain pattern, document and sketch to the extent necessary.
- ii) Scrape off onto clean paper.

- For lifting some **blood spatters (dried)** use **clean fingerprint tape**

- **Leather** contain chemicals which tend to destroy biological samples and inhibit PCR. **Remove stains as soon as possible from these.**

Packaging materials

- Paper is porous material, hence allows air exchange with atmosphere.
- This property allow samples to completely dry, even when they are not entirely dry at the time of initial packaging.
- Paper envelope or bags are easiest way to pack the evidence.

- A clean paper should be placed over the stained garment and then the garment should be folded.
- This would help to prevent direct contact between separate stains.

N. B.

- **Do not pack** wet garments or garment with wet stains **in air tight or plastic container.**
- The sample would retain moisture which promotes bacterial growth and sample deterioration.

Future Developments

Hand- held-device (lab. on chip) for rapid DNA profiling at S.O.C. Single integrated platform which can extract, amplify and sequence DNA have been developed.

STR typing from single cell (1ng=200 cell) pm 1 in 50 million

Collection of Forensic Evidence in Drug Facilitated Sexual Assault (DFSA)

- There has been an increase in the use of some drugs to render a person incapacitated and more susceptible to sexual assault. Some of these drugs are available over the counter
- The true incidence of DFSA is difficult to determine since not all victims present for timely medical care or receive drug screening.
- Due to the nature of the assault, delayed reporting is common

- Victims of drug-facilitated sexual assault often have limited memory of events occurring after drug [ingestion](#) (anterograde amnesia).
- Brief periods of awakening (“cameo appearances”) often occur in response to loud noises or pain.
- The victim might remember being unable to move or speak or might recall witnessing part of the assault.
- Once the victim sleeps off the drug, she is sometimes ambivalent about reporting the assault to law enforcement or accessing health care.

- In one study of DFSA, 24% of the victims had no recollection of events and 59% had unclear or “patchy” memories.
- Only 15% had “clear and concise” memories of the event.
- This worsens the crime, leaving victims unable to provide a history and powerless to fight back.
- Victims of DFSA are less likely than other sexual assault victims to report the crime to the police, are more likely to delay medical care, and are less likely to have genital and nongenital trauma.

- Cases with forensic evidence and victim injury are more likely to be prosecuted, so DFSA victims are less likely to see a just resolution of the crime.
- The ideal drug for surreptitious administration and facilitation of a crime should be colorless, odorless, tasteless, easily obtained, and have a rapid onset of action.

- If a patient complaint of sexual assault or displays the following indicators, Proper collection, preservation, and analysis of physical evidence is essential to the successful investigation and prosecution of sexual assault cases
- Dizziness(giddiness/vertigo/faintness/lightheadedness/unsteadiness/disequilibrium/wooziness)
- Drowsiness
(sleepiness/lethargy/stupor/tiredness/weariness/fatigue/exhaustion/laziness)
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- Impaired judgment
- (difficulty in forming evaluative opinions or reaching conclusions concerning available evidence, often about people and courses of action. **Impaired judgment** may lead to seemingly irrational actions and risk-taking behaviors. Marijuana **can** slow **reaction time**, **impair judgment** of **time** and distance, and decrease **coordination**. Drivers who have used **cocaine** or methamphetamine **can** be aggressive and reckless when driving)
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- Confusion(misperception/mix up/muddle/mistake/slipup)
- Impaired motor skills
- (**Motor impairment** is the partial or total loss of **function** of a body part, usually a limb or limbs. This may result in muscle weakness, poor stamina, lack of muscle control, or total paralysis**Motor impairment** is partial or total loss of function of a body part, with poor stamina, lack of muscle control, or total paralysis.
- Slurred speech
- (**Slurred speech** is a symptom characterized by poor pronunciation of words, mumbling, or a change in speed or rhythm during talking. The medical term for **slurred speech** is dysarthria. **Slurred speech** may develop slowly over time or follow a single incident.)
- Reduced inhibition
- (Social **inhibition** can sometimes be **reduced** by the short-term use of **drugs** including alcohol or benzodiazepines.Lowered **inhibitions can make a person** more prone to fall victim to crimes, such as sexual assault and date rape.
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COLLECTION OF SPECIMENS FOR TOXICOLOGICAL ANALYSES

- Since most drugs and metabolites are present at higher concentrations in the urine, toxicologists can detect their presence for longer periods of time,
- urine should always be considered the specimen of choice for toxicological testing.
- As it is impossible to reliably predict exactly how long a drug or its metabolite will remain at detectable levels in urine, it is essential that efforts be made to collect the first available urine specimen from the victim.
- When there has been a substantial delay in the collection of a urine specimen, the likelihood of detecting the presence of a commonly encountered DFSA drug or metabolite decreases dramatically, however, urine specimen should be collected up
- to 96 hours post-ingestion, not after the victim wakes up.

- Most of the common DFSA drugs will no longer be detectable at 96 hours, some with longer half-lives may still be.
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- Every time the victim urinates, evidence of drug consumption is essentially lost.
- It is important that the victim be instructed not to urinate until the specimen can be collected.
- In circumstances where the victim cannot wait until the sexual assault examination, then he/she should collect the urine themselves in a clean container and take it with him/her to the examination.
- Then, during the examination, a second urine specimen can be obtained and the results of the two specimens compared.

- It is recommended that at least 100 mL of urine be collected in a standard urine collection cup.
- This volume of urine allows for a very comprehensive, sensitive toxicological analysis to be performed.
- If the victim cannot produce 100 mL of urine, then collect what he/she can produce or take a second collection when they can produce more urine.
- It is not advisable to have the victim drink a large quantity of water to generate this urine as this may render a more diluted sample than would normally be produced.
- Instead, allowing the body to naturally produce the urine will likely yield the most useful result.

- Once collected, there is no need to add a preservative to the urine specimen.
- No research studies exist that suggest a significant loss of drugs in urine samples due to lack of preservatives. However, as with all biological specimens, it is important that the urine be maintained in a refrigerated or frozen condition.
- This will prevent putrefaction of the specimen which may interfere with certain toxicological assays or prevent the detection of certain drugs.

COLLECTION OF BLOOD SPECIMENS FOR TOXICOLOGICAL ANALYSES

- Blood specimens are also useful to forensic toxicologists, especially when the victim of a DFSA is able to report the crime shortly after the drugging.
- In general, blood should only be collected during the first 24 hours after the drugs were suspected to have been ingested. After 24 hours, most DFSA drugs and metabolites are no longer at detectable levels in the blood.
- Blood (10-30 ml) for toxicological testing should be collected into gray-stoppered tubes (containing sodium fluoride (preservative) and potassium oxalate (anticoagulant))

COLLECTION OF HAIR FOR TOXICOLOGICAL ANALYSES

- Consideration should be made to routinely collect hair in these cases, especially when there has been a substantial delay in reporting the crime.
- There are numerous instances where hair has shown a history of drug use. Human hair grows at a rate of approximately 1/2 inch (~1 centimeter) per month. If the victim has short hair or there is a delay of months in collection of the hair sample, evidence of the drugging may have been removed with his/her last hair cut.

- It takes one to two weeks for drugs to begin to appear in the hair above the scalp.
- Hair should be cut by isolating a 1/4 – 1/2-inch section of head hair from the victim using rubber bands, ensuring that the end closest to the scalp is clearly marked. The hair should be cut close to the scalp and placed into a paper envelope.

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ADDITIONAL SPECIMENS THAT MAY BE USEFUL FOR TOXICOLOGICAL ANALYSES

- Nausea and vomiting are common symptoms of many of the drugs related to DFSA.
- These drugs take time to completely absorb into the bloodstream after ingestion.
- When a victim vomits shortly after ingestion of a drug, the substance may not have had an opportunity to completely absorb into the bloodstream.
- Thus, the vomitus may contain a significant amount of the drugging agent, so collection and analysis of this specimen should be assessed in these cases.
- If the vomitus has dried prior to collection, the article that contains the vomitus should be submitted to the laboratory for testing.

- If it has not dried, it should be carefully transferred into a clean container, such as a urine collection cup.
- There are other stains that may be discovered in these cases that should be collected for toxicological testing.
- Occasionally, the victim may release her bladder and a urine stain may be present on bedding materials or clothing.

- Also, there may be stains on items as a result of vaginal or rectal bleeding. If these stains are large enough, these items may also be analyzed for many of the same drugs and metabolites that would be found in a traditional urine or blood specimen.
- Items such as suspected recreational drugs or prescription medications; bottles, cups, or cans; used condoms; or sexual stimulation devices.
- The importance of each of these will vary from case to case, but it is best to initially collect, preserve, and store these items for later testing, if necessary.

COLLECTION OF PILLS, TABLETS, OR SUSPECTED DRUGS

- It is important to search for pills and tablets that may have been used.
- Typically, the perpetrator will choose to use a drug or drugs readily available to him.
- If he belongs to a gym or frequents “rave” parties, then one should take extra care to look for GHB or GBL containers.
- If the perpetrator suffers from depression, then one should look for sedative antidepressants such as amitriptyline or desipramine.
- If he/she has a family member that takes sleeping pills, then one should search for benzodiazepines or related drugs.
- When submitting pills and tablets to the laboratory, they should remain in their original containers, if present.
- Alternatively, medications may be sealed in a plastic bag prior to submission to the laboratory.

- One of the most overlooked drugs at a crime scene is GHB. Since it is typically dissolved in water and is colorless, it may be stored in water bottles or may be colored and stored in sports drink bottles.
- It may also appear as a cleaning product, health drink, eyedrop solution, or even hair spray.
- All liquids should be tightly capped and double-sealed in plastic bags. Excessive heat should be avoided when storing these samples.

COLLECTION OF CUPS, CANS, CONTAINERS, DISHES, ETC.

- Drugs used to commit DFSA have been administered to a victim in almost every conceivable manner.
- While delivery through a beverage in a cup, glass, can, or bottle is the classic example, these drugs have also been administered in food or through voluntary ingestion by the victim.
- Occasionally, a search of the crime scene may reveal evidentiary items such as a cup, can, or bottle that the victim believes the drug was delivered in.
- Analysis of remaining liquid or residue in these containers may reveal the drugging agent used.
- The evidence should be collected in such a manner as to preserve its original condition.

- If some liquid remains in the container, it should be documented and then transferred to a sterile container that can be tightly sealed.
- Both the container and the liquid should be chemically analyzed for the presence of common DFSA drugs.
- Dried residues that remain in a cup or bottle should also be documented before packaging, and submitted.
- Suspect food should be frozen to prevent spoilage.
- It is good practice to obtain a control sample of any food or beverage that is believed to have been spiked.
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COLLECTION OF CONDOMS AND SEXUAL DEVICES FOR CHEMICAL EXAMINATIONS

- Analyses for DNA and hairs are usually the most important examinations done on condoms or sexual devices, however, chemical examination of this evidence may occasionally provide useful information .
- Condoms found at SOC may contain spermicide and lubricants that can be compared to condoms found in the possession of a suspect.
- latex additives may allow for a more unique comparison .

- **Lubricants are often used to sodomize victims** in sexual assaults. These lubricants may consist of petroleum jelly, lotion, or oils.
- When traces of lubricant are discovered on a sexual device or swabs from the sexual assault examination, chemical comparison to a suspect lubricant can exclude or include it as a source.
- Condoms and sexual devices should be placed in paper bags and appropriately sealed.

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- Visible lubricant on these devices may be swabbed and placed into small, paper envelopes.
- If such swabs are taken, control swabs in a separate envelope are required.
- Occasionally, the investigation may be enhanced through determination of the use of a spermicide.

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OTHER EVIDENCE IMPORTANT TO DFSA CASES

- While every DFSA case is different with its own peculiarities, a commonality among many of these cases is the suspect's desire to photograph or videotape the victim during the assault.
- The photographs and video can prove to be very important evidence documenting the scene and the victim's condition during the assault.

- Pornographic magazines, newspaper articles, books on pharmacology, sexually explicit literature, or other items that provide information about DFSA.
- Internet provides free exchange of information .
- This exchange of information includes tips on committing criminal actions

- Numerous sites that provide information about the drugs used to commit this crime, how to administer them without being detected, where to buy the drugs, and even how to make them at home.
- In DFSA case, it may prove useful to seize the suspect's computer to determine if he/she has taken an interest in DFSA by looking at their Internet browsers.

Recap

- Much of the evidence collected from victims and scenes of DFSA is the same as that collected from non-DFSA cases.
- The introduction of drugs as a weapon to commit sexual assault requires the investigator to collect a **urine specimen from the victim as soon as possible**.
- By following the proper procedures, valuable evidence can be obtained in a safe manner.
- The accuracy by which these tasks are performed may provide justice to the victim

Vitriolage (Acid Attack)

- Sulphuric, Nitric, HCL, Phenol, Aqua Regia (Nitric+HCL 1:3).
- Blue Litmus Paper – **RED** – Acid
- **Red** Litmus Paper – **BLUE** – Alkali
- Pack exhibits in glass/plastic container
- Remaining acid in separate glass container

- Search for stains of acid on clothes, vehicle , body of the accused.
- Pack clothes in polythene & in plastic container.
- Swab from victim during medical examination / PM .

Bride Burning Cases

- Foot prints ,finger / palm smears.
- Blood/ bloodstains.
- Container of inflammable material.
- Pieces of partially burnt garments and ashes (air tight containers)
- Partially burnt hair (air tight container)
- Pieces of broken bangles.(air tight container)

- Condition of doors, windows, - position of bolts / handles / latches (whether in closed or open position).
- Pattern of smok deposit on walls, ceiling ,handles , bolts ,latches.
- Soot deposited should be collected for chemical analysis(airtight containers)
- Pieces of burnt bones (if cremated)

- Hair and garments during PM (in air tight glass containers).
- Garments of accused (air tight container)
- Shoe / foot print impression of accused (if required).

Do's	Don'ts
To establish identity of deceased from skeletal remains, always collect intact long bones (femur, humerus)/molar teeth in duplicate	Never prefer to collect the clavicle bone.
Preserve tissue, fetus and other similar samples in 0.9% DNS and keep it in refrigerator for a short period if there is any delay in completing legal formalities for forwarding the sample to the laboratory.	Never use formalin to preserve tissues and bones.
Liquid blood with EDTA in sterile vials and container having tissue, fetus and other similar samples should be kept in thermos flask/ thermocol box stuffed with ice/coolant packs.	
Always wrap stained clothes and fabrics in paper sheet after completely drying and pack in cotton cloth or aerated container.	Do not pack clothes/garments, stains and swab in wet condition.
If there is more than one sample pack them separately.	Never dry stains, swabs in direct sunlight, by use of heater, hot air blower etc.
From dead body always take two or more types of samples in duplicate.	Do not send completely burnt/broken bones, burnt or singed hairs.
Always use paper bag as packing material for biological evidence.	Never use polythene bag as packing material for biological evidence.

A close-up photograph of a bouquet of daisies in various colors including yellow, pink, red, and magenta. A white card with the words "Thank You" written in a black cursive font is tucked into the flowers. The background is softly blurred, showing more of the bouquet and green foliage.

Thank You