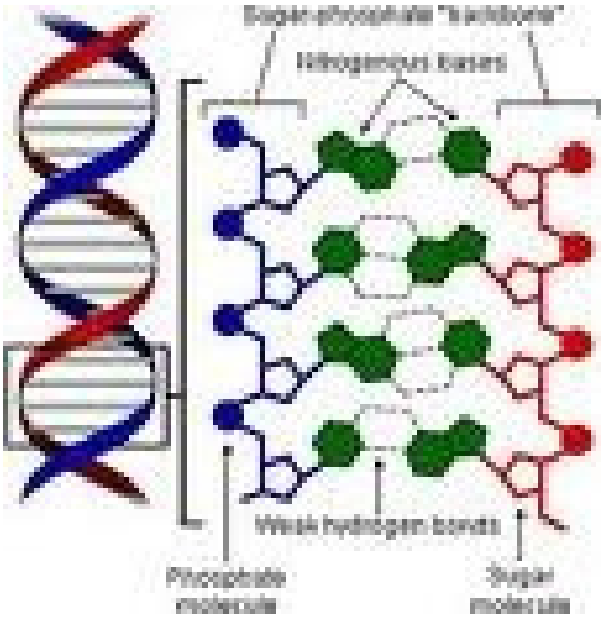
WORKSHOP FOR
MEDICAL OFFICERS

Reading Material



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Collection of Evidence for DNA Fingerprinting

Crime is as old as human civilization. The primary aim of forensic examination is to collect the evidence that may help to prove or disprove a link between individuals and / or between individuals and objects or places. DNA i.e. Deoxyribonucleic acid is the vehicle of generational transference of heritable unit. Forensic DNA analysis or DNA fingerprinting helps in establishing an association between biological evidence and its source ie a suspect, victim, crime scene or weapon. In analysis, specific genes in the questioned item are compared with those in the known specimen.

Collection, preservation and handling are the integral part of DNA fingerprinting."Medico legal" term incorporates the basis of two sister professions i.e. medicine and law. The medicolegal experts can provide a link between these two professions for smooth effective functioning in a scientific manner. Area where medicolegal experts may have to collect specimens for DNA fingerprinting are-

- Paternity disputes
- Sexual offences
- Heinous crime
- Mass Disaster

Earlier forensic scientists have been employing gene coded polymorphic products to link a suspect to the crime . They have been using different techniques like blood grouping, HLA typing, isozyme grouping etc. in the biological material recovered at the scene of crime for investigation. These tests are based on proteins, which get highly degraded with time. Thus there was necessity for identification of biological material, which on the one hand is very stable and on the other hand is so variable that it is individual specific. The discovery of DNA fingerprinting caught the

imagination of forensic scientists to link with certainty the origin of biological material.

DNA fingerprinting has had a major impact on the criminal justice system and law during the last decade of the 20 th century. It has been employed in criminal law to help prove guilt or innocence , in family law to prove paternity , and in immigration law to prove blood relationships or to establish citizenship. Its usefulness as a human identification tool is evident. Accordingly in recent years our legal system has given DNA fingerprinting the credibility that nature has given it as the blue print of life.

WHAT IS DNA

DNA or deoxyribonucleic acid is the genetic material and the carrier of genetic traits. A part of DNA of various individuals is the same, but another part differs from individual to individual (except in the case of identical twins). Portions of DNA structure of certain genes are as unique to each individual as fingerprints. Alec Jeffreys and his colleagues who were responsible for these revelations named the process for isolating and reading these DNA markers as "DNA Fingerprinting". In forensic examination narrowing the source of biological material i.e. individualization remains an elusive goal. DNA fingerprinting has brought forensic scientists to the brink of this goal. It provides a virtually foolproof method of establishing identity including parentage of an individual.

The human body is made up of 60 trillion cells. In the cell there are strands of genetic material called chromosomes. Each human cell (except red blood cell) contains 23 pairs of chromosomes-23 from the father and 23 from the mother. Each chromosome consists of a long chemical molecule of DNA complexed with proteins. DNA is a polymer i.e., a chain of small repeated sub units found in the nuclei of all human cells (except red blood cells) and sub cellular structure mitochondria. The structural unit of DNA is

deoxyribonucleotide. A segment of DNA which instructs the body cells to make proteins that determine everything from eye colour to our susceptibility to resist diseases is the fundamental unit of heredity called **gene.** However function of 95 percent of DNA is not yet understood and is known as junk DNA in which lies the mystery of individualization, i.e., why one person is so different from another. DNA fingerprints of different unrelated individuals are different while related individuals show a high coefficient of similarity.

DNA is made up of three components- (i) nitrogen bases (ii) carbohydrates (deoxyribose sugar) and (iii) phosphate. There are four types of nitrogen containing bases in DNA—Adenine(A), Guanine(G), Thymine(T) & Cytosine(C). Adenine and Guanine are called purine and Thymine and Cytosine are pyrimidine. Sugar along with phosphate groups form the backbone to which these bases are linked.

The double helix model of DNA was proposed by Watson and Crick (1953). The two strands are linked by hydrogen bonds between pair of bases. Adenine on one strand always pairs with thymine via two hydrogen bonds (A=T) and guanine with cytosine via three hydrogen bonds (G≡C). Out of 3.3 billion base pairs that make a human being, approximately 3 million differ between any two individuals i.e., only one – tenth of a single percent of DNA differs from one person to the other.

DNA FINGERPRINTING

DNA fingerprinting or DNA typing or DNA profiling is a technique that detects DNA pattern unique for every individual. It is a complex process of analysis of some highly variable regions of DNA. It involves the intersection of several scientific disciplines, including molecular biology, genetics and statistical analysis. It is a reliable molecular tool for the law agencies for resolving certain critical issues in crime investigation.

Portions of the DNA molecule of the non coding region contain sequences of letters that are repeated numerous times (tandem repeats) and

offer a means of distinguishing one individual from another through DNA fingerprinting. Within the world population there are numerous possibilities for the number of times a particular sequence of base letters can repeat themselves on a DNA strand. The stuttered region of DNA where a short sequence of bases, typically 20 base pair long, is repeated over and over again is called "**minisatellite**". In case of **"microsatellites"** a short sequence of DNA, about 3 to 7 base pair long, is repeated. Forensic scientists scan 15 different regions that vary from person to person and use the data to create a DNA profile / fingerprint of that individual. The probability that another person has the same DNA profile for a particular set of regions is extremely low. In criminal cases the scientists extract the DNA from different samples and analyze it for the presence of a set of specific DNA regions (markers). The following DNA technologies are used in forensic investigations –

(i)Restriction Fragment Length Polymorphism (RFLP)

The methods used in DNA fingerprinting are conventional techniques of molecular biology. The first technique that was adopted for forensic DNA analysis was RFLP.

Unfortunately, the RFLP technique requires a greater amount of better quality DNA than the newer PCR based techniques. In addition forensic evidences are often old, degraded and of limited quantity where RFLP is sometimes not possible.

(ii)PCR Analysis

Polymerase Chain Reaction (PCR) is used to make millions of exact copies of DNA from biological samples. DNA amplification with PCR makes possible DNA analysis of biological samples as small as few skin cells.

(iii) STR Analysis

The latest method of DNA fingerprinting, short tandem repeat (STR) or microsatellite analysis has the potential for a higher discrimination and also

reduces the amount of time to obtain results. It also requires a sample size smaller than that needed for RFLP methods. STR technology is used to evaluate specific regions (loci) within nuclear DNA. STRs are locations (loci) on chromosome that contain short sequence elements that repeat themselves within the DNA molecule. The repeat sequence as mentioned earlier is 3-7 bases and the entire strand of STR less than 400 bases in length. Hence, STRs are less susceptible to degradation and may often be recovered from bodies or stains that have been subjected to extreme decomposition. The Federal Bureau of Investigation (FBI) uses a standard set of thirteen specific STR regions. The odds that the two individuals will have the same 13 loci DNA profile is about one in one billion. The following steps are involved in STR analysis -

- Extracting and purifying DNA from biological evidence.
- Amplification of selected genetic markers through PCR i.e., polymerase chain reaction.
- Visualizing the fragments and genotyping.
- Statistical analysis and Interpretation.

(IV) Mitochondrial DNA Analysis (mt DNA)

In the investigation of cases that remained unsolved for many years mt DNA is extremely valuable. Nuclear DNA must be extracted from samples for RFLP, PCR and STR, however mt DNA analysis uses DNA extracted from mitochondria (another cellular organelle). Older biological samples that lack nucleated cellular material for example hair, bones and teeth can be analysed with mt DNA. All daughters have the same mt DNA as their mothers because mitochondria of each embryo comes from mother's egg cell-father's sperm contributes only nuclear DNA. Comparison of mt DNA profile with profile of a potential maternal relative can be an important technique in solving missing persons identity and maternity disputes.

(V) Y-chromosome Analysis

The Y-chromosome is passed directly from father to son and hence the analysis of genetic markers of Y-chromosome is especially useful for analyzing biological evidence involving multiple male contributors.

The advantages of DNA Fingerprinting can be summarized as follows -

- Discrimination potential is very high hence individuals as close as brothers or sisters (except monozygotic twins) can be identified.
- DNA profiling is feasible even from degraded or very minute amount of biological material (at times invisible to the naked eye) because of high sensitivity.
- DNA molecule is very stable.
- DNA profiling can be done from any biological material and is not restricted to any specific organ/area of the body, unlike dermal fingerprinting.
- Determination of species of origin and gender is feasible.
- DNA fingerprinting leads to better administration of justice and increased public confidence in the Criminal Justice System.

APPLICATIONS

(A) Civil Cases

1. In proving paternity/maternity
2. Solving cases of switched babies
3. Determining immigration status
4. Identification of victims of accident, fire, natural disasters etc.
5. Delineating family lineage

(B) Criminal Cases

1. Solving murder cases
2. Linking victim and culprit in sexual offences
3. Identification of mutilated bodies/ skeletons/ source of tooth pulp
4. Sexing biological material
5. Solving crimes related to animals
6. Solving crimes related to plants

LEGISLATIONS

Cr.P.C. and DNA Testing

(i) Section 53, Cr.P.C.-

The title or marginal notes of Section 53 is "Examination of accused by medical practitioner at the request of police officer".

No doubt the provisions of Section 53 are applicable during investigation and when a person is in custody after his arrest on a charge. As per the section -

1. When a person is arrested on a charge of committing an offence of such a nature and alleged to have been committed under such circumstances that there are reasonable grounds for belonging that an examination of his person will afford evidence as to the commission of an offence, it shall be lawful for registered medical practitioner, acting at the request of a police officer not below the rank of sub inspector, and for any person acting in good faith in his aid and under his direction, to make such an examination of the person arrested as is reasonably necessary in order to ascertain the facts which may afford such evidence, and to use such force as is reasonably necessary for that purpose.

2. Whenever the person of a female is to be examined under this section, the examination shall be made only by, or under the supervision of, a female registered medical practitioner.

[Explanation- *In this section and in Sections 53-A and 54,-*

(a) "examination" shall include the examination of blood, blood stains, semen, swabs in case of sexual offence, sputum and sweat, hair samples and fingernail clipping by the use of modern and scientific techniques including DNA profiling and such other tests which the registered medical practitioner thinks necessary in a particular case;

(b) "registered medical practitioner" means a medical practitioner who possess any medical qualification as defined in clause (h) of Section 2 of the Indian Medical Council Act 1956 and whose name has been entered in a State Medical Register.]

(ii) Section 53A, Cr.P.C.-

Section 53A relates to specific accused who has been arrested for charges of rape or its attempt and there are reasonable grounds for believing that the examination of his person would afford evidence, the accused may be examined medically at his arrest and even a reasonable force may be used, which is necessary for the purpose for such examination. The examination of the accused has been subjected to the condition, that "there are reasonable grounds for believing" that examination would afford evidence.

(iii) Section 164A, Cr.P.C.-

The provision of Section 164A relates to examination of a victim of rape, including taking a sample from her person, with her consent for "DNA profiling". For a very long time victims of any kind of assault and injury, including victims of rape had been medically and forensically examined and the examination report prepared during such examinations was produced in courts as evidence.

As per the section, the registered medical practitioner, to whom such woman is sent shall, without delay, examine her person and prepare a report of his examination giving the following particulars, namely-

(i) the name and the address of woman and of the person by whom she was brought;

(ii) the age of the woman;

(iii) the description of the material taken from the person of the woman for DNA profiling;

(iv) marks of injury, if any, on the person of the woman;

(v) general mental condition of the woman; and

(vi) other material particulars in reasonable details.

It seems that there is sufficient law in existence to deal with DNA evidence, in the state it is at present. Where peculiar situations arise the courts have inherent powers to deal with such situations as they have been doing now.

MEDICOLEGAL ASPECTS

A. MEDICO LEGAL ASPECTS OF SEXUAL OFFENCE

Collection of Forensic DNA Evidence

The rationale for collecting forensic evidence is to link a suspect to the victim of the crime. In order to collect suitable forensic evidence, the health worker must understand the types of evidence that may be present. The selection of the sample taken should be directed, in part, by the hospital or clinic. Specimen collection should be performed as soon as possible in order to minimize loss and degradation of the sample (e.g. loss of semen from drainage, douching, etc.).

Control sample

A general principle when collecting evidence for forensic purposes is to collect a control or reference sample at the same time as any evidence or test sample, which may be connected to the crime. A control sample is a known sample, for example, blood, hair or tissue, which may be compared with a sample obtained from the crime scene (e.g. semen from the vagina of a rape survivor or blood-stained clothing).

Storage of samples and preservation of chain of evidence

Steps to ensure that the evidence is reliable include: using appropriate containers or bags; proper labeling; proper sealing (e.g. use of tamper-proof seals); secure storage; and maintenance of the chain of custody. This will result in the forensic analysis being acceptable to the court. The samples should be initiated and dated by the collector and handed to the investigating officer who should sign for their receipt. If there is any delay in handling the samples to the investigating officer or laboratory, the samples should be securely stored, preferably in locked facility with restricted access until they are handed over.

Preservation of samples

Wet samples (e.g. clothing) should be air dried to prevent growth of bacteria and fungi which may degrade DNA making the sample unsuitable for analysis. Samples containing biological evidentiary material such as DNA should be stored in a cool dry environment or refrigerated to prevent putrefaction (decomposition) which may render the sample unsuitable for analysis. Care must be taken to avoid contamination of the sample by the health worker who may inadvertently add material such as hair, blood or bacteria during collection, preservation, or handling of the sample.

Taking of swabs

The purpose of taking swabs is to collect samples of any body fluids that may have been deposited on the outside of the rape survivor's body or on any interior orifice which may assist to connect the assailant with the alleged assault through DNA analysis of the samples. The areas of the body from which the samples are taken may help to corroborate the survivor's version of the events that are alleged to have occurred. These areas include the inside of the mouth (for evidence of semen) or the exterior of the vagina (for evidence of saliva) if oral sex was performed; the areas around the aureole or breast if they were bitten, licked or sucked by the assailant (for evidence of saliva); the face, neck, cheeks or lips of the mouth if they were kissed or licked by the assailant (for evidence of saliva); any areas of the body, head or limbs on which the assailant may have ejaculated (for evidence of semen); and under the fingernails where the survivor may have scratched the assailant.

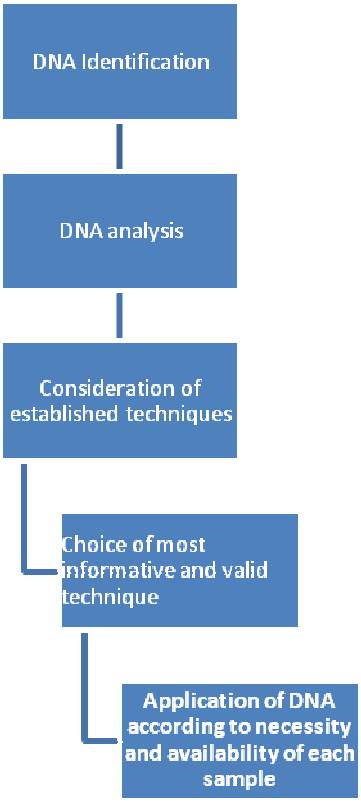
Body fluids

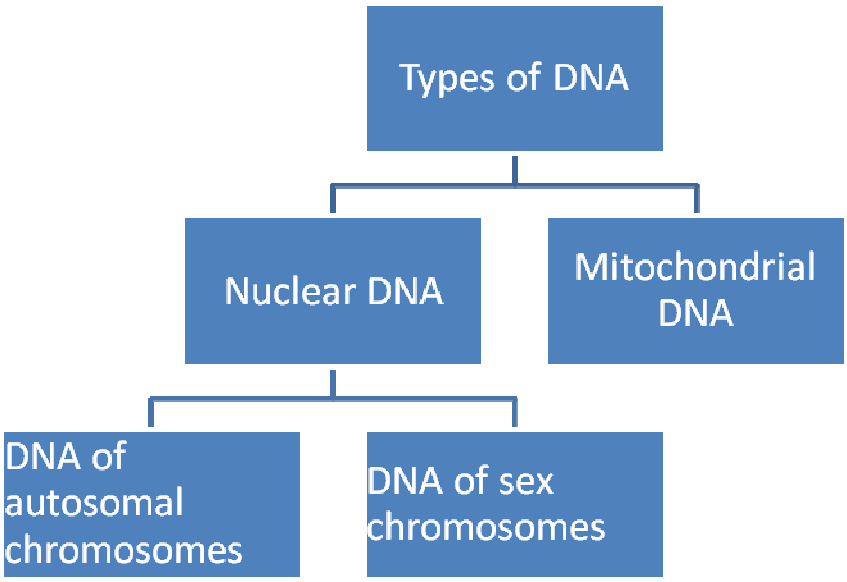
Body fluids such as blood or semen are likely to remain stuck on the rape survivor's skin if they become air-dried and are not washed off or absorbed by materials such as clothing or bedding. Saliva may evaporate but will leave cells from the oral mucosa behind. The length of time that spermatozoa will last in a survivor will depend upon where it is deposited on the body.

B. MEDICOLEGAL WORK IN MASS DISASTER

There is no justification from the medico-legal standpoint not to follow all scientific procedures for the recovery, transfer, identification, and final disposal of the remains of disaster fatalities. A select group of experts

who are experienced in these procedures should oversee the process. However, in situations where experts are not available, the community physician should take leadership and make use of all available resources to carry out the job.


DNA Identification
DNA analysis
Consideration of established techniques
Choice of most informative and valid technique
Application of DNA according to necessity and availability of each sample


Types of DNA
Nuclear DNA
Mitochondrial DNA
DNA of autosomal chromosomes
DNA of sex chromosomes

C. MEDICOLEGAL WORK IN PARENTAGE DISPUTE

Presently blood is the classic, conclusive sample for determining DNA. Blood can be obtained by capillary or venous puncture.

The following table lists the range of forensic specimens that are typically of interest for a medicolegal expert along with appropriate collection techniques and comments on their relevance.

Table 1-Forensic Specimens

Site	Material	Sampling	Sampling Instruction
Anus (rectum)	Semen	Cotton swabs and microscope slide	Use swab and slides to collect and plate material; lubricate instruments with water, not lubricant.
	Lubricant	Cotton swab	Cotton swab, dry swab after collection.
Blood	DNA (Victim)	Appropriate tube	Collect 2 - 5 ml of venous blood in EDTA vial or prepare stain on FTA paper.
Clothing	Adherent foreign materials (e.g. semen, blood, hair, fibers) .	Paper bag(s)	Clothing should be placed in a paper bag(s). Collect paper sheet or drop cloth. After air dry wet items should be bagged separately.
Genitalia Male & female	Semen	Cotton swabs and microscope slide	Use separate swabs and slides to collect and plate material collected from the external genitalia, vaginal vault and cervix; lubricate speculum with water not lubricant or collect a blind vaginal swab.
Hair	Comparison of hair found at crime scene	Sterile container	Cut approximately 20 hairs and place hair in sterile container.

Mouth	Semen	Cotton swabs, sterile container	Swab multiple sites in mouth with one or more swabs. To obtain a sample of oral washing, rinse mouth with 10 ml water and collect in sterile container
	DNA (victim)	Cotton swabs	
Nails	Skin, fibers, blood etc. (from assailant)	Sterile toothpick or similar or nail scissors/clippers	Use the toothpick to collect material from under the nails or the nail(s) can be cut and the clippings collected in a sterile container.
Sanitary pads/ tampons	Foreign material (e.g. semen, blood, hair)	Sterile container	Collect if used during or after vaginal or oral penetration.
Skin	Semen	Cotton swab	Swab sites where semen may be present.
	Saliva (e.g. at sites of kissing, biting or licking), blood	Cotton swab	Dry swab after collection.
	Foreign material (e.g. vegetation, matted hair or foreign hairs)	Swab or tweezers	Place material in sterile container (e.g. envelope, bottle)

Table 2- Collection of Forensic DNA Evidence

SPECIMENS/ SAMPLES	COLLECTION	PURPOSE
Clothing	• Air dry wet or blood stained clothing (do not use extreme sources of heat e.g. blower, hairdryer etc.) • Once dried, place in paper bags (not plastic) • Do not store wet clothing. • Ensure packaging is properly labeled and delivered to laboratory as early as possible. • If delivery is to be delayed, store in a secure cool dry place.	• Identification of assailant using semen, blood or saliva stains or hair on clothing • To show corroborative evidence of force used eg. torn clothing • To identify place where the crime was committed
Semen	• Semen on clothing should be treated as above. Collection of semen from body surface, mouth, anus, genitalia should follow the protocol given below- • A smear on glass slide by rolling a swab over a slide with out rubbing it as the latter may cause the spermatozoa to break and thereby give a false negative result. The slide is then air dried. • **Fixative** should not be used • All samples should be properly sealed, packaged and labeled.	• Identification of assailant • Confirmation of samples of semen
Blood	• Prepare stain on FTA paper; or • At least 2-5 ml blood should be collected as a control sample in EDTA vial. • Blood- stained clothing and objects should be treated as described above. • Separate items that are blood stained should be packaged individually and labeled and treated as above.	• To ascertain if the sample is from assailant or survivor, is with consent to intercourse/ defend her self.

Pubic or Head hair	• Hair sample should be collected using clean sterilized forceps • Individual hairs or clumps of hair should be separately packaged, • Hair with root tissues, or mixed with blood, body fluids or other tissue must be carefully collected to retain the integrity of the samples. • Hair mixed with wet fluids should be air dried as described above. • Control sample of body, scalp, auxiliary and pubic hair should be taken. • Ideally by plucking and not by cutting the tips to obtain hair roots that contain adequate DNA for analysis.	Identification of assailant vs. survivor.
Bones	• Wash with running water then air dry, place material in sterile cloth bound envelope/ wrap in paper or cloth.	Identification of body.

Table 3- DNA Content of Tissues

Source	DNA content (approximate)
Amniotic fluid	65 ng/ml ($1X10^4$ cells/ml at 16 weeks gestation)
Blood	40 µl (1 µl = 4 $X10^3$ to 11 $X10^3$ WBC, 1 WBC= 6.6 pg DNA
CVS	8 µg/mg
Hair roots	250 ng/plucked hair root
Liver	15 µg/mg
Muscle	3 µg/mg
Sperm	3.3 pg/cell

BASIC DO's & DONT's

Do's:

GENERAL (WITH SEXUAL ASSAULT VICTIM)

- Make sure you understand your own attitudes and feeling about sexual assault
- Let the victim know you believe her
- Let the victim know she survived, and that is not failure but success
- Encourage the victim cry, yell or talk
- Listen

TECHNICAL---

- To establish identity of deceased from skeletal remains, always collect intact long bones (femur, humerus)/ molar teeth in duplicate.
- Preserve tissue, foetus and other similar samples in 0.9% DNS and keep it in refrigerator for a short period if there is any delay in forwarding the sample to the laboratory.
- Always wrap stained clothes and fabrics in paper sheets and pack in cotton cloth or aerated container.
- If there are more than one sample, pack them separately.
- From dead body always take two or more types of samples in duplicate.
- Submit samples in laboratory without any delay.
- Always use disposable gloves, mask, syringes, dropper, blade, scissors for handling and collecting samples.

Don'ts:

GENERAL (WITH SEXUAL ASSAULT VICTIM)

- Do things for the victim without asking her first
- Get angry with victim
- Blame the victim
- Boss the victim around
- Rant and rave at the offender
- Try to make the victim believe the sexual assault was not serious

TECHNICAL-

- Never prefer to collect the clavicle bone.
- Never use formalin to preserve tissue and bones.
- Do not pack clothes/ garments, stain and swabs in wet condition.
- Never dry stains, swabs in direct sunlight by using heater, hot air blower etc.
- Never use cork/lid in vials while packing swab of semen, blood and other body fluids.
- Do not send completely burnt/ broken bones, burnt or singed hair.
- Never use polythene bag as packing material for biological evidence.

GUIDELINES

A. Evidence collection in sexual offences

Technical-

Step1: Oral specimen

Collect seminal fluid in the oral cavity for DNA analysis in cases where there is suspected oro-genital contact.

Step2: Collection of panties and sanitary pad

Collect the panties worn by the survivor during or after the incident. The sanitary pad must not be removed if it is attached to the panties. If the sanitary pad was detached at the time of medical examination, the sticky side of sanitary pad must be covered by waxed sheet to prevent the pad from sticking to the paper collection bag.

Step 3: Evidence of the patient's body

Collect and preserve any physical or biological evidence that may be present on patient's hair, skin or fingernails and to collect additional foreign debris. The site to be sampled is determined by asking the patient, by examination and by use of an ultraviolet light source, which will reveal stains that are invisible in normal light. The swab should be placed in dry rack of the swab guard box. If the bite marks are present they should be photographed after taking the necessary swab.

Step 4: Pubic hair

Comb to obtain any loose hair or debris that may help in identifying the assailant. Any matted hair may indicate the presence of blood or semen and should be cut over another sheet of catch paper so that it falls on to the paper which should also be folded and labeled.

For reference purposes in order to obtain a comparative sample from the patient she should be asked to allow about 10 hairs to be pulled from her pubic region.

Step 5: Collection of ano-rectal specimens

Conduct a thorough examination of ano-rectal region in order to record trauma and to obtain biological material for DNA analysis. In cases of possible ano-rectal assault external and rectal swabs should be collected.

The patient should be placed in a comfortable position for an anal examination and swabbing. The swab be slightly moistened with sterile water and the anus carefully swabbed, slightly extending into the anal canal.

Step 6: Genital specimens

Perform a thorough examination of the genital area in order to identify and record any trauma and to obtain biological material for DNA analysis which will assist in identifying the suspect.

- Swab the external genitalia in order to collect any saliva or semen that may be present. Moisten the swab with sterile water and swab the external and internal surfaces of labia majora, including the clitoris, the periurethral area and the fossa navicularis.
- Take a swab of interior and posterior vaginal fornices using a speculum before an internal digital examination is performed.
- Swab the cervix for collecting as much of mucous plug as possible.

Others:

(1) **Contamination**: Wear gloves at all times both to protect yourself and to avoid contamination of evidence.

Be aware that DNA contamination can occur easily—

Avoid coughing or sneezing over swabs and ensure that any surfaces used for swabs are uncontaminated. Use disposable paper towels on surfaces.

(II) **Reference sample:** Sample provided by a known person, for instance a victim or suspect for DNA analysis are reference samples.

Forensic DNA analysis is a science of comparison and reference blood samples of both victim and suspects are required for comparison of profiles generated from evidence material.

(III) **Swabs and slides for trace evidence:** Sterile swab must be used for the recovery of biological samples from individuals and crime scenes; ensure that these items are guaranteed to be sterile and uncontaminated.

Prepare dry mounts by smearing each swab onto appropriate microscope slide. Allow the smear to air dry, label with examinee's name, date and indicate which swab the slide was made from.

Types of swabs collected for the purpose of reference DNA samples-

buccal or oral swab (saliva/ bite marks), vaginal and cervix swabs (semen), penial swabs etc.

Label each specimen on the envelope as follows:

- Name of examine-
- Date of examination, time of examination-
- Name of individual sample-
- Site of collection if applicable-
- Name of examining doctor-
- Signature of examining doctor on seal of envelops etc.-
- FIR No. and Parcel No.-
- Description of specimen seal-
- Name of the accused/victim-

(IV) Fingernail scrapings and trace evidence

Fingernail clippings and fingernail scrapings from the left and right hands should be collected in pre-labeled self-sealing plastic bags and put into labeled envelope.

(V) Hair samples

- Different combs should be used to collect any loose hair or fibres from the head and pubic area over the piece of clean paper. The pubic hair combing and the comb are placed in the envelope.
- Where there is evidence of semen or other matted materials on pubic or head hair, it may be collected with the help of a moistened swab. The swab should be placed in a small paper envelope and labeled “Possible secretion sample from head (pubic) hair.

The second approach is DNA analysis of the hair root and/or sheath of the root. However, the sheath cells surrounding hair roots are more likely to be present when the hair is pulled from the scalp, as might happen, for example during assault/violence.

B. Evidence collection in autopsy samples

Tissue and aborted foetus

- Deep muscle tissue samples and aborted foetus for DNA analysis should be collected in plastic bottles and transported on dry ice.

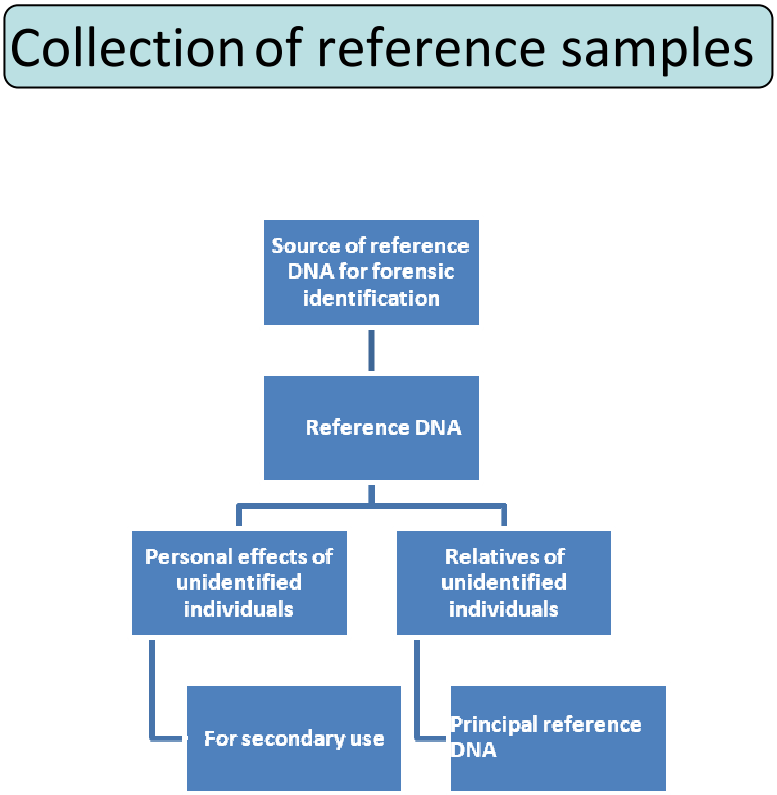
Bone

- Preferably long bones (femur/humerus) and sternum should be sent for DNA analysis. Totally charred bones should not be sent for DNA profiling.
- Exhumed bones should be cleaned properly. All the sticking debris should be removed.
- Clean bone should be packaged.

C. Evidence collection from clothing

a. To minimize loss of evidence a hospital sheet should be placed on the floor and a clean paper sheet should be placed on the top of the sheet. The patient should disrobe over the paper sheet.
b. After air drying items such as dresses, blouses, shirts etc. they should be put into paper bags.
c. Any wet stains, such as blood or semen should be allowed to air dry before being placed into paper bags. It is preferable that each piece of clothing be folded inward, placing a piece of clean paper against any stain, so that the stains are not in contact with the bag or other part of the clothing.

Evidence collection of reference samples



(I) Conclusive samples from living subjects

- **Blood**

Blood is the classic, conclusive sample for determining DNA. Blood can be obtained by capillary or venous puncture.

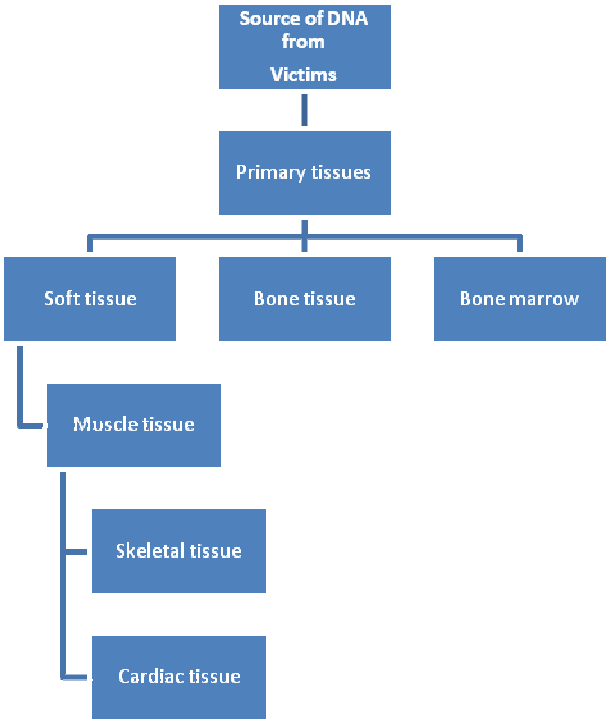
- **Buccal epithelial cells**

These cells are collected from the inside of the subject's cheeks, using sterile dry swabs. Two samples are taken- one swab is rubbed on the inside of the left cheek and another swab is used on the right cheek. The swab should be identified and left to dry at room temperature in a protected area. They must not be placed in a container until

they are completely dry since the bacteria in saliva proliferate rapidly in moist conditions and will degrade DNA.

- **Hair follicles**

  Between 10 and 15 hairs with roots should be pulled from the subject.



(II) Conclusive samples in dead bodies

(a) Conclusive samples in well preserved bodies

- **Post mortem blood**

  A sample of about 10 ml of blood should be drawn into a tube containing an anticoagulant (EDTA type).

- **Skeletal muscle**

  Select two skeletal muscle fragments (weighing about 10 gms and approximately 2 cm wide) from the best preserved area of the body, and place them in a plastic container that has a wide mouth and screw-on lid. This type of tissue is preferable because along with cardiac muscle, it is most resistant to decomposition.

- **Teeth**

If there are doubts about the preservation of the corpse, it is advisable to extract four teeth, preferably molars and save them so that exhumation of the body for identification purposes can be avoided. Prior to the extraction, a dental chart should be completed.

(b) Conclusive samples in charred corpses

Despite the external appearance, the stability of DNA at high temperatures allows genetic analysis in corpses where charring is not complete by using fragments of skeletal muscles from deep regions of the body, and from semi-solid blood that remains inside cardiac cavities. If charring is total, it is advisable to contact the laboratory for an evaluation of the available samples and their condition to determine which would be most appropriate for analysis.

(c) Conclusive samples in decomposed or skeletonized corpses

Remaining decomposed tissue should be removed from bone, and a long bone, preferably the femur, should be used. If not possible to obtain this sample, the laboratory should evaluate available samples and their condition to determine which would be most appropriate for analysis.

- **Teeth**

After a dental chart has been completed, select at least four teeth, molars where possible. The samples should not have been damaged or subjected to endodontia.

E. Preventive Guidelines

i. Personnel Protection Guidelines

All body fluids should be regarded as potentially infective.

- Cover any cuts or graze on hands with waterproof dressings.
- Wash hands especially when beginning or ending a new task, before break or meal times, before smoking, and at the beginning and end of duty periods.

ii. Disinfection Guidelines

- Commercial thick bleach can be used for spillages of biologically hazardous materials. This should be left in contact with the contaminated area before rinsing and wiping dry.
- For general disinfection for e.g. work surfaces after handling biological specimens, 1 in 10 dilution of commercial thick bleach should be used as above. It should be noted that dilution of thick bleach does not remain effective for periods in excess of a few days.

iii. Taking DNA Reference Samples

- The person taking samples must wear gloves throughout the whole sampling procedure.
- Open the sampling kit and ensure that the kit is complete checking off each item against the checklist provided. Follow the sampling instructions.
- If at any time during the sampling process the sample taken is dropped or comes into contact with any other surface the procedure should be stopped and the sampling kit disposed off. Sample will then be taken using a new DNA sampling kit.
- Once the samples have been successfully taken, collect the wrappers and gloves and dispose off these using designated receptacles.
- Insert the details of the donor and other necessary information on the form provided.
- Place the form together with the sample in the tamper evident container, store and send to the laboratory as per legal instructions.

iv. Anti contamination

- Due to sensitivity of current DNA techniques extreme caution including wearing of a face mask must be taken.
- All containers used for transportation e.g. cool boxes crates, boxes should be cleaned prior to and after use.
- Wherever possible sterile disposables sampling materials should be used.
- Disposable gloves must always be worn over top cuffs and should be changed after handling individual item/objects. Barrier clothing should also be used as often as possible.

- For serious offences wear disposable face masks, overshoes and suits fully done up the hood up.
- Handle items as little as possible and not re-open items for interview purposes- use paper bags with transparent panels.
- Always handle one item at a time.
- Where possible take the container to the evidence and not the evidence to the container.
- Contact between victim and suspect samples should be avoided at all times.
- Ensure that any person attending a crime scene has no contact with suspect or his/her clothing.
- Multiple suspects, the victim and their clothing must be kept apart at all times and should not be allowed to come into contact with the same objects Each item should be packaged sealed and labeled as soon as it is taken.
- Never pack several items/objects together.
- Use bags of a suitable size or shape, do not force items into packaging that are too small, bags may tear or lids may be forced off.
- Seal all packaging securely; use adhesive tape on all edges.
- Never reuse packaging.
- If an item will not fit or packaging is used in error do not use it for a different item. It must be discarded.
- Never eat, drink or smoke when recovering evidential samples.
- Dry sample should be kept at room temperature (cool if possible) and out of direct sunlight. Dry sample stored at ambient temperature should not deteriorate/decompose/degrade and will remain suitable for future DNA

analysis. Breathable bags, cardboard packaging and brown bags will allow samples to dry out whilst safely packed away and should be stored as above.

- If samples are air dried then this must take place in an area free from any contaminants for eg. in a sterile drying cabinet. If this is not achievable and there is any risk of minor contamination then samples should not be air dried.
- If samples are frozen then they should be kept frozen and never be allowed to thaw and /or refreeze since this will cause break down of DNA.
- Plastic bags can on rare occasions be used to transport very wet items but this should be on the instructions of the Forensic Science Laboratory.
- All samples containing biological materials should be placed into suitable secondary packaging for transport to the laboratory. Local transportation regulations should be adhered to- international biohazard sign can be used.

F. Precautions during Collection and Dispatch of Samples

(I) Protection of personnel

Prevent, at all times, direct contact by the worker with the sample, using gloves, masks, gowns, or other protective clothing; Prohibit the consumption of food, drink and tobacco products while handling the sample; maximize asepsis and use disposable materials whenever possible. Once sample collection is complete, place all used disposable materials in containers for biological waste, and follow standards for disposal of biological waste. When sample collection takes place in the autopsy station, extreme precautions should be taken.

(II) Protection of samples

- **Contamination by human biological material**

This occurs when human biological material is deposited at the site of the event or in corpse following the event. It can be caused by onlookers, family members, or persons involved in the investigation who accidentally or out of ignorance, contaminate the

sample. This occurs frequently when minimal precautions when collecting evidence are overlooked or packaging is defective.

- **Contamination or loss during transfer of biological evidence**

This occurs, usually accidentally, during the transfer of evidence from one site to another and can result in the contamination or loss of a sample. It happens most frequently when hair samples are moved.

- **Microbiological contamination**

This type of contamination occurs when microorganisms develop, possibly as a result of humidity or high temperatures. Normally the microorganisms grow or proliferate because of defects in packaging or shortage prior to sending the samples to a laboratory.

- **Chemical contamination**

This makes it difficult to amplify and extract DNA. It occurs when samples are immersed in preservatives such as formalin or when chemicals have been used in previous tests (for example, fingerprints), thereby compromising DNA analysis.

- **Systems for packing and preserving samples**

Recommended packing and transportation procedures are outlined below:

1. Identification of samples:

There should be enough space on all receptacles to identify the samples and to write the following:

- Reference number of the sample;
- Type of sample:
- Ownership of sample, and location.

2. Chain of custody

There also should be a space dedicated to the chain of custody with the name and signature of the person who collected the evidence, and the date and hour of collection.

(III) Packaging

(a) Jars or receptacles

With liquid evidence, organs, soft tissue etc., the receptacles should have screw-on lids or airtight closures; they should already have been sealed with tape and correctly identified, and should be kept refrigerated and sent to the laboratory under refrigeration as soon as possible.

(b) Dry, sterile swabs

Swabs used to collect samples will be packed in small cardboard boxes commercially designed for this purpose**.** This type of box protects the swabs and allows them to completely dry out. Once identified, they will be sealed with tape and sent without refrigeration to the laboratory. If it is not possible to obtain specially designed boxes, once the swabs have been used to collect the biological specimen they should be identified and numbered, placed in a protected area, and allowed to dry completely at room temperature before being placed in a container. Once dry, the swabs can be placed in correctly identified container, sealed with tape, and sent to be laboratory.

(c) Samples with dry stains

Each sample is placed on top of paper that will be folded and placed in a paper bag, sealed with tape and correctly identified. This should be sent to the laboratory without refrigeration.

(D) Hairs, nails etc:

This kind of material should be collected in small pieces of paper that will be carefully folded and put in a paper bag, sealed with tape, and correctly identified. This should be sent to the laboratory without refrigeration.

(e) Bones and teeth

These should be placed in a paper bag(s) and cardboard box(es) that are sealed with tape and correctly identified. They can be sent to the laboratory without

refrigeration. If tissue is still attached to bones, airtight, plastic receptacles should be sent to the laboratory as soon as possible.

INSTRUCTIONS

- In cases of maternity / paternity dispute, blood samples of mother, child and suspected biological father are required.
- For identification of deceased/ unidentified corpses/ human remains, blood samples of nearest relatives ie., father, mother, children, brother, sister are required along with the remains.
- While collecting sample from the dead body, at least two different types of samples are collected – always collect samples in duplicate.
- The samples should be collected in following order of preference-

I. 2 to 5 ml blood collected directly from the heart (cardiac puncture)

II. In cases where no liquid blood can be obtained skeletal red muscles (50-100 gms) should be collected in DNS.

III. Intact long bones in following order of preference-

(i) Femur

(ii) Tibia

(iii) Humerus

(iv) Teeth (Preferably Molar)

(v) Ribs

IV. In sexual assault cases exhibits collected from the victim/ suspect (garments, swab, slide etc) alongwith blood samples of the victim/suspect and of suspect are required.

SAMPLE COLLECTION KITS/ MATERIAL

(1) EDTA vial for whole blood

(2) FTA classic/ indicating card

(3) Buccal DNA collector

(4) Secur swab

VISCERA MANAGEMENT SYSTEM

INTRODUCTION

The word toxicology is derived from the Greek word “Toxican” which is believed to have been used for the poisonous substance into which the arrow head were dipped. A poison may be generally described as any substance which, when administered or taken in small quantity, is capable of producing deleterious symptoms on the body. In another sense a substance may be termed a poison that has a cumulative effect if administered for a length of time so that it ends fatally. There are many substances eg. Aspirin, barbiturates tranquilizers etc; which are primarily termed as medicines but have produced toxic symptoms. It is, therefore, not possible to draw a boundary line between a medicine and a poison, because a medicine in a toxic dose is a poison and a poisonous substance in very small doses may act as a medicine. In fact, a medicine and a poison can only be differentiated in the intent with which it is administered; not for saving the life or controlling a disease, but to cause damage to health or to kill the person.

In a suspected case of poisoning, special attention is needed at the time of post mortem examination. The tissues and the organs in which the poison is suspected to be present, should be preserved for chemical examination. The chief evidence of a poison having been administered, is in its detection within the body. If symptoms, autopsy findings or other evidence serve to pin point some particular poison, the task becomes easy. But the isolation and identification of an unknown poison taken or administered, at time creates problems which are not very easy to tackle. To complicate matters putrefactive changes in the body tissues, it is found, also effects the nature of some of the organic poisons. The quantity of the poison at times being very small and also due to its unknown nature accompanied by its metabolic changes by the body organs, require the skill and acute judgement of a skilled analyst to successfully isolate them.

The availability of newer instruments have helped in solving the problems of detection and identification of poisons with comparative case. The nature of the poison used must naturally respond to the particular line of chemical analysis necessary both for its detection and the estimation of its quantity. The first step to identification of a poison is its isolation into

characteristic group followed by its detection and identification by available techniques.

The toxicological examination requires a first rate experienced chemical analyst possessing a wide knowledge of modern equipment and methods of analysis.

Toxicology deals with science that embodies the knowledge of sources, character and properties of the poison, the symptoms they produce, the nature of their fatal effects, lethal doses and the remedial measures that should be taken to combat their actions or effects.

POISON

Any substance which is administered in the body by any means, source, produces ill health, disease or death is known as poison.

APPROPRIATE MATERIAL FOR DETECTION OF POISONS-

Two types of material may be referred to toxicological laboratories for the analysis of poisons.

(a) In survival cases and (b) In fatal cases.

Survival cases-

Following materials may be sent for analysis:

Stomach wash, vomited material and stained clothes etc, blood sample, urine and faeces if available, suspected material recovered from the possession of the victim or accused and from the scene of crime, food or drink, residual poisonous material etc.

Fatal Cases-

Besides the above mentioned material, the portions of viscera of the deceased must also be sent which should consist of full stomach with its contents, part of small intestine with its contents, full liver with gall-bladder, one kidney, spleen, full lung, heart and brain tissues must also be sent in those cases where the poison is suspected to be consumed by inhalation. Uterus with foetus may also be helpful in suspected cases of abortion where local abortifacient might have been used. Hair with root length and nails should be sent in chronic poisoning by arsenic, thallium etc. Piece of skin and tissue from site of bite should also be preserved in cases of snake bite. Burnt bones and ashes should be preserved for analysis in cases if dead body has been cremated.

The skeleton or the remnant bones are the important material for analysis in cases of exhumed bodies when no visceral tissues are available for toxicological examination.

CONTAINERS FOR THE MATERIALS TO BE PRESERVED

Wide mouth glass bottles of about 2 liter capacity having air tight stoppers are most suitable containers for the visceral tissues, (Glass must be arsenic free which should be established by testing before hand). These bottles should be numbered and labeled properly which should mention about the details of the case, nature of the contents preserved, place and date of preservation etc. and should bear the signature of the autopsy surgeon, (A proforma of the label to be pasted on the container is given below:

Label

ARTICLE FOR ANALYSIS

Case No. ……Districts ……

State versus ……. son of……. Resident of ……. Charged under section…….. in Indian Penal Code.

Number and date of the letter reporting the dispatch of the parcel to Director……..

Content (full details with name of deceased or name of owner or possessor of the article in English).

Civil Surgeon / Dy. C.M.O.

of

4. PRESERVATIVE FOR SAMPLE

Alcohol is the most suitable preservative for preservation of portions of viscera except in those cases in which poisoning by alcohol, phenol where instead of alcohol, a saturated solution of common salt should be used.

Preservation by alcohol-

The tissues are taken into the container and to it is added sufficient alcohol so that whole of the tissues are dipped into the liquid.

Preservation by saturated solution of common salt-

The tissues are taken into the container and to it is added sufficient saturated solution of common salt so that whole of the tissues are dipped into the solution. (Some excess quantity of undissolved salt should remain at the bottom).

Preservation by solid common salt-

Powdered common salt may also be used for preservation of the post mortem tissues. The tissues are taken into the container and to it sufficient solid common salt is added and the tissues are immersed well with the salt and of the container and over the tissues.

A sample of alcohol or saturated solution of common salt or solid common salt used for preservation must also be sent in a separate glass bottle for analysis to exclude the presence of any poison in it.

Preservation of blood sample-

For preservation of blood sample, any of the following preservative may be used.

(i) Sodium fluoride 20 mg. for each ml. of blood.

(ii) Sodium citrate and mercuric chloride mixture-5 mg. sodium citrate and 0.1 mg. of mercuric chloride for each ml of blood.

SEALING OF CONTAINERS AND OTHER MATERIALS

In medico legal cases proper sealing of the exhibits plays utmost important role. Therefore the exhibits sent to the laboratory for analysis must be properly sealed. Care must be taken that no tempering should be possible without breaking, tempering or removing the seal impressions.

The glass bottles containing portions of viscera and / or other materials should be sealed in the presence of the authorized official and these bottles in turn should again be packed properly in some wooden box having sufficient packing material so as to check the breakage of the bottles during transit. These wooden boxes should again be sealed with authorized seal samples.

Other articles should also be separately packed, sealed and then all such sealed packets should be repacked in one parcel and then finally sealed by the authorized official.

These parcels and boxes etc. should always contain a label showing the description of the contents.

The sample of the specimen seal affixed on the packets, bundles, bottles and viscera bottles etc. should also be sent in separate cover to facilitate the comparison of seal impressions found affixed on the parcels received.

The documents and other information which should also accompany the sample of material, to help the quick disposal of the case: They are listed below:

(a) Authority letter from the Magistrate or concerning authorised official i.e. the forwarding letter to authorize the laboratory to undertake the chemical analysis of the material.
(b) A copy of first information report (F.I.R.) regarding the case.
(c) A copy of post mortem report or the medical report by the authorized medical officer regarding the case.
(d) Information collected by the investigating officer particularly the replies of some querries which should be furnished by the investigating officer. These are as given below :

INFORMATION TO BE SUPPLIED BY THE POLICE IN CASES OF SUSPECTED HUMAN POISONING

(i) Name, sex and age of patient
(ii) Nature of food last taken
(iii) How soon after this meal did the symptoms of poisoning begin?
(iv) Did the patient walk from the place where first taken ill, if so, how far?
(v) Did the patient complain of pain or discomfort?
(vi) Was there purging?
(vii) Was there vomiting?
(viii) Did the patient become unconscious, if so, how soon did this occur, after the onset of the symptoms?
(ix) Was the patient dizzy or faint?
(x) Did convulsion or cramps occur?
(xi) Was tingling of skin or throat complained of?
(xii) Did the patient talk sensibly or foolishly?
(xiii) Did the patient pick at objects on the ground or bed?
(xiv) Was any treatment adopted, if so, what was its nature?
(xv) Did death occur, and, if so, how soon after the illness began?
(xvi) What poison was supposed to have been used?

Signature of the police official and date

Note- Wherever possible a report by a medical official who has been the case should be added which should contain his opinion as to the nature of the poison used. Any information given by friends and neighbours should be noted.

STUDY OF IMPORTANT POINTS BEFORE STARTING ANALYSIS

Before starting actual analysis of the material received in the laboratory, the analyst concerned must study the following points:

(a) Seal, impressions affixed on the material received must by carefully checked and compared with that of the specimen seal sample received under separate cover with the case exhibits.

(b) All the documents and information received along with the case, should be thoroughly studied to have an idea of the alleged suspected poison ingested or taken by the victim during life time.

(c) Inventory of the material received should be prepared including the nature of the material, quantity received, its odour, pH, presence of any particular foreign body etc. The proforma for the purpose is suggested and is detailed below:

NAME OF THE LABORATORY

Place :

Case No. :

The contents of the case are following :

Label (1) …….

Received a seated viscera bottle no……. glass jar having ……. Seals, containing.

(1) Stomach open and empty /tied

PH odour

Sediment

Label (2) …….

Received a scaled viscera bottle No……. / glass jar having ……. Seals, containing.

(2) Piece of intestine.

(3) Piece of liver with galls bladder.

(4) One kidney

(5) Spleen

(6) Piece of lung

(7) Piece of heart

(8) Piece of brain.

(9) Uterus foetus

Label (3) ……

(10) Sample of preservative spirit /saturated solution of common salt in a sealed phial.

ANALYTICAL PART

CLASSIFICATION OF POISONS ACCORDING TO SYMPTOMS

1. **CORROSIVE POISONS :**

   Strong acids and alkali i.e. H_2SO_4, HNO_3, NaOH, KOH etc.

2. **IRRITANT POISONS :**

Classified into three types-

A. Inorganic Poisons

(i) Non-Metallic : Phosphorous, Chlorine, Bromine, Iodine, etc.

(ii) Metallic Poison : Arsenic, Antimony, Mercury, Copper, Lead, Zinc, Barium, Aluminium, Bismuth, etc.

B. Organic Poisons

(i) Vegetable Poison : Dhatura, Aconite, Opium, Nuxvomica, etc.

(ii) Animal Poison : Cantharides, Snakes, Insects, etc.

C. Mechanical Poisons

Diamond dust, powdered glass, hair, etc.

3. **SYSTEMIC OR NEUROTIC POISON –**

A. Affecting the Nervous System: affecting the brain (Cerebral)

I. Somniferous poison: Opium and its alkaloids, Barbiturate, etc.

II. Inebriants poison : Alcohol, Ether, Chloroform, etc.

III. Deliriant poison :Dhatura, Belladona, Hyoscyamus or Cannabis Indica, etc.

B. **Affecting the Spinal Cord (Spinal)** : Nux Vomica, Gelsemium, etc.

C. **Affecting Peripheral Nervous System** : Curare, Conium, etc.

D. **Affecting the heart (cardiac):** Aconite Tobacco, Hydrocyanic acid, etc.

E. **Affecting the Lungs (Asphyxiants):** Carbon-di-Oxide (CO_2), Carbon Mono Oxide (CO), Coal Gas, etc.

CLASSIFICATION OF POISONS FROM ANALYTICAL POINT OF VIEW

1. **Volatile Poisons**
   Cyanides, Alcohols, Phosphides, Denaturants etc.
2. **Insecticides**
   Organochloro Insecticides,
   Organophosphorous Insecticides,
   Carbamates Pesticides etc.
3. **Metallic Poisons** : Arsenic, Antimony, Mercury, Copper, Lead, Zinc, Barium, Aluminium, Bismuth etc.
4. **Non Volatile Organic Poisons** : Opium and its alkaloids, Strychnine, Dhatura, Aconite, an Diazepine Drugs.
5. **Toxic Anions** : Sulphates, Nitrates, Nitrites, Chlorates etc.
6. **Miscellaneous Poisons** : Kaner, Croton Tigllium, Marking Nut, Castor Oil Seeds, Ergot Madar, Cyano genetic glycosides, Indian hemp etc.

Table 1

Typical samples for toxicological analysis-

Type	Quantity	Analysis
Blood (heart, femoral)*	20 ml.	Volatiles, drugs
Urine	20 ml.	Drugs, heavy metals.
Bile	20 ml.	Narcotics, other drugs
Kidney	Entire	In absence of urine
Liver	20 gm.	Many drugs
Gastric contents	Total	Drugs taken orally
Vitreous humor	Both eyes	Alcohol, glucose, drugs and electrolytes

Table2

Pathological observations can hint at possible poisoning

Pathological Observation	Possible cause
Burns around mouth, lips, nose	Acids
Skin of face and neck quite dark	Aniline, nitrobenzene
Severe, unexplained diarrehoea	Metals (arsenic, mercury, copper etc.)
Pupil of eye dilated	Atropine (Belladona), Seopolamine
Burns around mouth lips, nose	Bases (lye, potash, hydroxides)
Odor of disinfectant	Carbolic acid or other phenyl
Skin is bright cherry red	Carbon monoxide
Quick death, red skin, odor of peach	Cyanide
Vomiting, abdominal pain	Food poisoning
Diarrhea, Vomiting Abdominal pain	Metallic compounds
Convulsion	Nicotine
Pupil of eye contracted	Opiates
Odor of garlic	Oxalic acid, Phosphorous
Convulsion	Sodium fluoride

Table 3

Common analytical techniques in forensic toxicology

Type of Compound		Analytical Method	Reference
Gases and Volatile Compounds	Simple mixtures, known compounds	Gas Chromatography (GC)	Heep>//en.wikipedia.org/wikie/ Gaschromatography
Gases and Volatile Compounds	Complex mixtures, unknown compounds	Gas Chromatography / Mass Spectrometry (GC/MS)	http./en.wikipedia.org/wiki/ Gas chromatography-mass spectrometry.
Non volatile organic compounds	Simple mixtures, known compounds	High Performance Liquid Chromatography (HPLC)	http://en.wikipedia.org/wiki/ Liquid Chromatography # High performance liquid chromatography 28 HPLC.29.
“	Complex mixtures, unknown compounds	Liquid Chromatography / Mass Spectrometry (LC/MS)	http://en.wikipedia.org/wiki Liquid chromatography. Mass spectrometry.
Toxic Metals		Atomic Absorption Spectrometry (AAS)	http://en.wikipedia.org/wiki Atomic absorpt on spectroscopy.

AVERAGE FATAL DOSE AND FATAL PERIOD OF COMMON CHEMICAL POISONS

Poison	Fatal Dose	Fatal period
Abrus Precatorious	Extract from 0.1 g to 0.15 g. of seeds (by injection)	3 to 5 days
Acetic Acid	4 ml. and above	1 hour to one day
Aconite	1.0 to 2.0 g. of roots	1 to 5 hours
Alcohol (ethyl)	250 to 500 ml.	1 few hours
Ammonium hydroxide	15 ml.	One day
Arecoline	Unripe beetle nuts toxic	
Arsenic	0.13 g. to 0.20 g.	Half to two days.
Aspirin	10 g. to 20 g.	A few hours
Atropine	0.1 to 0.2 g.	one day
Barbiturate	4 to 29 g.	few hours to several days
Benzene	25 ml.	few minutes to a few days.
Bitter almond	60 to 80 No.	few minutes to a few hours
Cannabis	Resin extract toxic	
Canthridine	60 mg. crystalline substance	A few hours
Carbolic Acid	15 ml.	3 to 4 hours
Carbon monoxide		30 minutes in an atmosphere of 1 percent CO.
Caustic alkali	14 g.	Within 24 hours
Chloral hydrate	3 to 5 g.	A few minutes to a few days.

Chloroform	Usually 30 ml	A few minutes to a few days.
Cocaine	0.6 to 1.0 g.	A few minutes to a few days.
Copper sulphate	15 g.	1 to 3 days.
Creosote	1.5 ml. and above	A few days.
Dhatura	1.5 g. seeds	Within 24 hours
D.D.T.	2 g. onward	A few hours to a few days.
Endrin	0.6 to 1.0 g.	2 to 3 hours
Ergot		One to 7 days.
Formalin	25 ml. to 75 ml.	A few hours to two days.
Gamexene	12 g.	A few hours
Heroin	0.2 g.	
Hydrocyanic acid	40 to 60 mgm.	2 to 10 minutes
Kaner	8 to 10 seeds	A few hours
Kuchila	One seed (powdered)	A few minutes to a few hours
Lead salts	Not known	One day to several days.
Madar		A few hours
Mandrax	5 to 10 g.	A few hours
Mercury salts	0.2 to 0.5 g.	A few hours to several days
Morphine	0.20 g. by mouth	8 to 10 hours
Mushrooms	Uncertain	One day to several days.
Methyl alcohol	30 to 250 ml.	One day to 4 days.
Naphthalene	2 g. and above	2 to 3 days.
Nicotine	0.06 g.	few minutes

Nitric acid	5 to 10 ml.	few hours to several days.
Oduvan	450 g. of powdered leaves decoction	few hours
Plum	One g. crude opium	few hours to a few days
Organo Phosphorus insecticides	0.1 to 1.0 g.	few hours
Parathion	25-175 mg.	few hours
Oxalic acid	4 g. to 16. g.	few minutes to a few hours
Potassium permanganate	5 to 7.5 g.	few hours to a few days
Potassium Chlorate	10 g. to 12 g.	few hours to a few days
Potassium hydroxide	15 g.	One day.
Potassium Cyanide	165 mg. and above	30 minutes
Quinine	Uncertain	few minutes to several day
Salicylic Acid	4 to 10 g.	few hours
Snake venom	0.02 g. through injection	few hours
Sodium Cyanide	122.5 mg.	30 minutes
Sodium hydroxide	15 g.	24 hours
Sodium nitrite	2 g.	30 minutes to 3 hours
Strychnine	0.05 g.	Within 2 hours
Sulphuric acid	4 ml.	few minutes to several week
Thallium salts	2 g.	24 hours
Turpentine oil	100 to 125 ml.	few minutes to 15 hours
Zinc phosphide	0.8 g.	Within a day.

FACTORS EFFECTING TOXICITY OF POISONOUS SUBSTANCES

(a) The general health and weight of the individual - The fatal dose of a person is directly proportional to the weight of the victim. As a general rule, the weaker the person, the quicker and severe will be the action of the poison.
(b) The condition of the stomach - Whether the stomach is full or empty at the time of ingestion of the poison.
(c) The acidity or the alkalinity of the system.
(d) Idiocyncracy of a person - whether an individual is very sensitive towards certain poison.
(e) State in which the poison is administered - In solid form, if so, in coarse pieces or in fine powder or in solution form.
(f) Degree of tolerance: For example some snake charmers get snake bites regularly and thus they get almost complete immunity from snake bite poisoning.

Certain addicts take opium or liquor regularly and therefore the addicts are unaffected by the normal fatal dose of the poisonous material.Further certain poisonous substances are well tolerated by children but elderly people are rather susceptible to those substance, such as mercury. On the other hand opium is well tolerated by aged people but children are very sensitive to it. Besides the system of some individual is such that they eliminate the poison quickly through vomiting and purging and hence the toxic affect diminishes to a great extent.

Age of the victim - This is the main factor as the list shows the general fatal dose for an adult person. To calculate the fatal dose for children, the following formula can be adopted.

$$\frac{\text{Average fatal dose} \times \text{Age}}{\text{Age}+12}$$

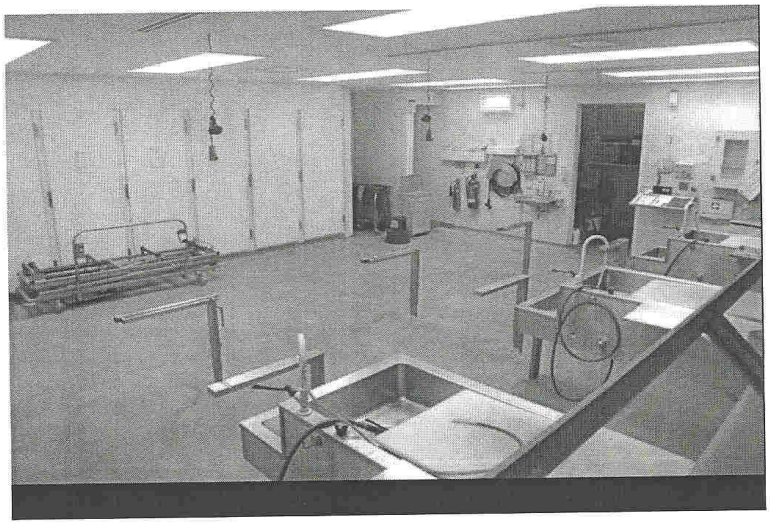
SUGGESTIONS FOR VISCERA MANAGEMENT SYSTEM

1. About 10 ml. blood from the body of the deceased.
2. About 10 ml. urine from the urinary bladder of the deceased
3. Organs should be sent in separately along with preservative in separate vial.
4. Whole stomach with its contents.
5. On model autopsy house at each district. (Annexure I) (Photocopy attached)
6. Post mortem should be done by M.D. Doctor.
7. Viscera should not be preserve in spirit if the death is due to alcohol poisoning.
8. Viscera should not be preserve in sodium chloride if death is due to hydrochloric acid.
9. In snake bite or injection poisoning case. Piece of skin and tissue from the site of bite or mark.
10. In burning cases Ash with bones .
11. In exhumed body cases, skeleton with soil.
12. In abortion cases, uterus with foetus.
13. In gaseous poisoning lungs and blood .
14. In Neurotic poisoning , brain should be preserved.
15. In strychnine poisoning spinal chord should be preserved.
16. In Aconite and HCN poisoning heart should be preserved.
17. Tissues should be preserved in suspected animal poisoning cases.
18. PMR should be filled in NHRC proforma. (Photocopy attached) Annexure-II.
19. Seals of parcel/ jar's/ bundles should be clear along with specimen seal.
20. Details of treatment should mentioned in treatment cases.
21. Cause of death should be clearly mentioned by Doctor in cases of Accident / AMI or disease.

ANNEXURE-I

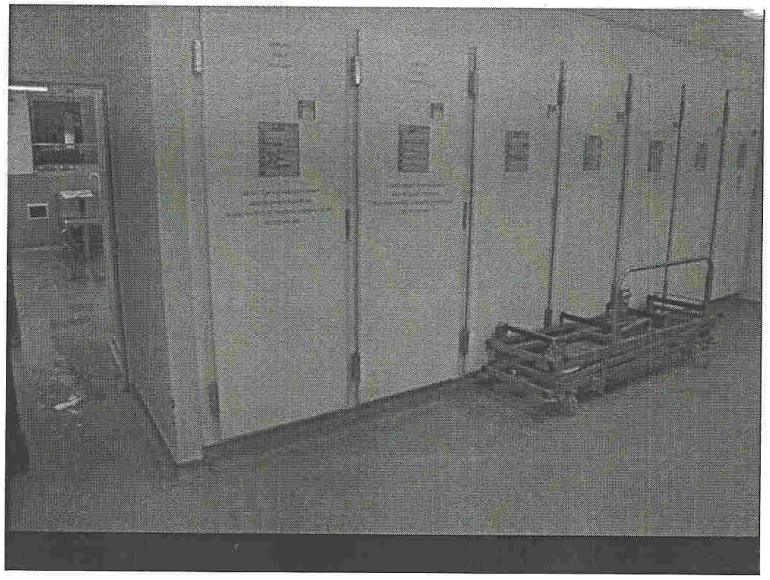
so that the bodies can easily be transferred out of the mortuary (Fig. 1.5).

These refrigerators should store bodies at 4°C.



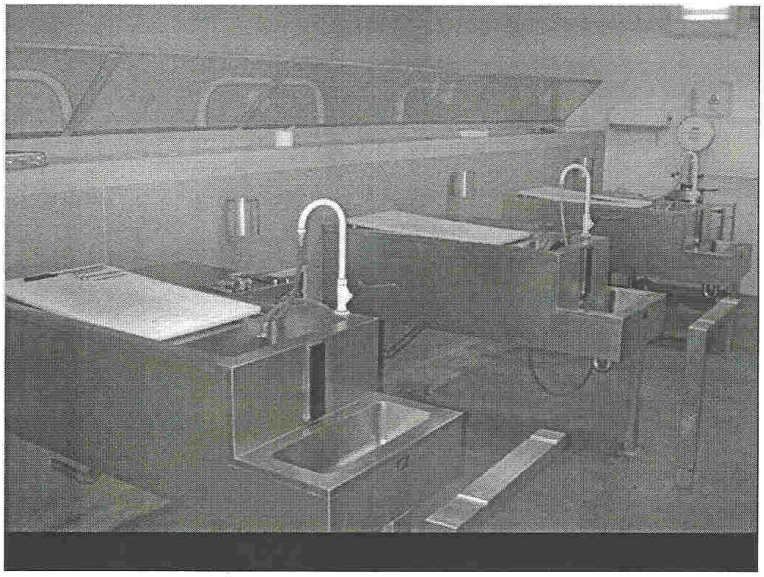
Figure

1.4. Mortuary with access to refrigerators from one side. (Courtesy of Mr. Dean Jansen, Whittington Hospital.)



Figure

1.5. Body transfer area with doors on the outer aspect. (Courtesy of Mr. Dean Jansen, Whittington Hospital.)

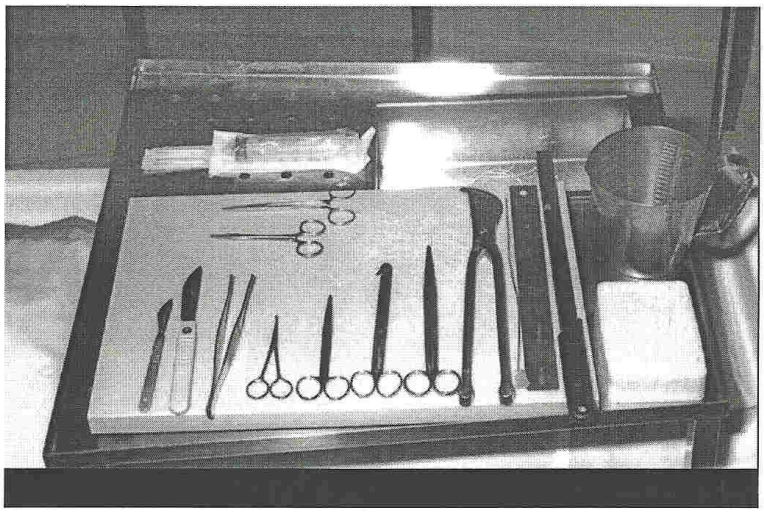


Figure

1.6. Dissection area adjacent to separate observation gallery (note the screen between the two). (Courtesy of Mr. Dean Jansen, Whittington Hospital.)

Change of Clothing

Outside clothing needs to completely removed and replaced with coverings for head, face, body, and feet. It is wise to wear a cap or hood to both protect the hair and to prevent long hair from obscuring the view and causing a

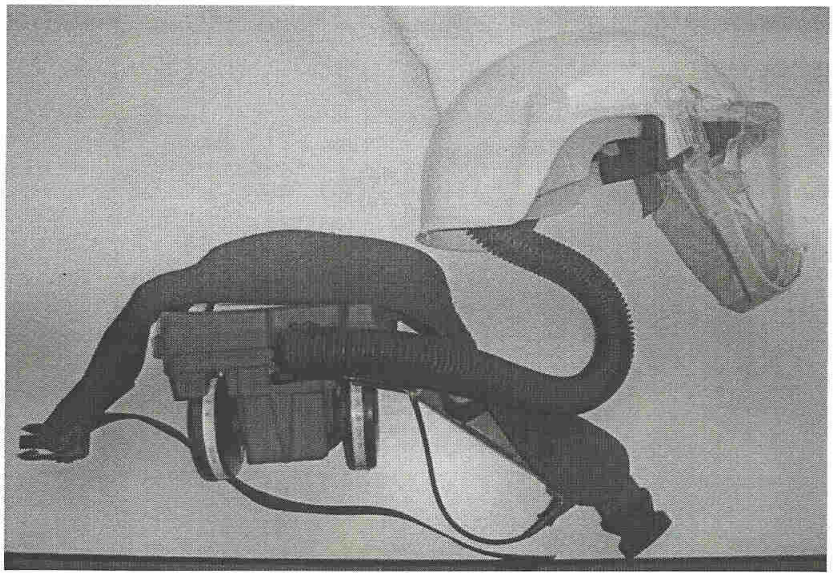


Figure

1.8. Routinely used instruments laid out on the dissecting board prior to post mortem examination. (Courtesy of Mr. Ivor Northey.)

occasion a handsaw), rib shearers, clamps, string, a ladle, and measuring jugs (Fig. 1.8). It is essential that all knife blades are either replaced for each examination or that knives with nondisposable blades and scissors are regularly sharpened, ideally freshly before every post mortem.

Other useful pieces of equipment include a block for support of the neck,



Figure

1.7. Personal respiration equipment used for high-risk cases with the potential for aerosol spread.

ANNEXURE-II

MODEL POST-MORTEM REPORT FORM

(Read carefully the instructions at Appendix 'A')

NAME OF INSTITUTION _____

Post Mortem Report No. _____ Date _____

Conducted by Dr. _____

Date & Time of receipt of the body

and Inquest papers for Autopsy _____

Date & Time of commencement of Autopsy _____

Time of completion of Autopsy_____

Date & Time of examination of the dead body

at Inquest (as per Inquest Report) _____

Name & Address of the person _____

video recording the Autopsy _____

Note: The tape should be duly sealed, signed and dated and sent to the National Human Rights Commission, Sardar Patel Bhawan, Sansad Marg, New Delhi.

CASE PARTICULARS

1. (a) Name of deceased and as entered

in the Jail or Police record_____

(b) S/O, D/O, W/O _____

(c) Address : _____

2. Age (Approx) :_____ yrs; Sex : Male/Female

3. Body brought by (Name and rank of Police officials)

(i) _____

(ii) _____

of Police Station _____

4. Identified by (Names & addresses of relatives/persons acquainted)

(i) _____

(ii) _____

IF HOSPITAL DEAD BODIES - (particulars as per hospital records)

Date & Time of Admission in Hospital _____

Date & Time of Death in Hospital _____

Central Registration No. of Hospital _____

SCHEDULE OF OBSERVATIONS

(A) GENERAL

(l) Height _____ cms. (2) Weight _____ Kgs.

(3) Physique - (a) lean/ medium / obese

(b) Well built/average built/poor built/emaciated

(4) Identification features (if body is unidentified)

(i) _____

(ii) _____

(iii) Finger prints be taken on seperate sheet and attached by the doctor.

(5) Description of clothes worn - important features:

(6) Post-mortem Changes :

(a) As seen during inquest

- Whether rigor mortis present _____

- Temperature (Rectal) _____

- Others _____

(b) As seen at Autopsy -

(7) (a) External general appearance -

(b) State of eyes

(c) Natural orifices

(B) EXTERNAL INJURIES:

(Mention Type, Shape, Length x Breadth & Depth of each injury and its relation to important body landmark. Indicate which injuries are fresh and which are old and their duration.)

Instructions :-

(i) Injuries be given serial number and mark similarly on the diagrams attached.

(ii) In stab injuries, mention angles, margins and direction inside body. (iii) In fire arm injuries, mention about effects of fire also.

C) INTERNAL EXAMINATION

1. HEAD

(a) Scalp findings

(b) Skull (Describe fractures here & show them on body diagram enclosed)

(c) Meninges, meningeal spaces & Cerebral vessels

(Hemorrhage & its locations, abnormal smell etc. be noted)

(d) Brain findings & Wt. (Wt. _____ gms.)

(e) Orbital, nasal & aural cavities - findings.

2. NECK

- Mouth, Tongue & Pharynx

- Larynx & Vocal cords

- Condition of neck tissues

- Thyroid & other cartilage conditions

- Trachea

3. CHEST

- Ribs and Chest wall

- Oesophagus

- Trachea & Bronchial Tree

- Pleural Cavities - R -

- L -

Lungs findings & Wt. - Rt. _____ gms. & Lt. _____ gms.

- Pericardial Sac

- Heart findings & Wt. _____ .

- Large blood vessels

4. Abdomen

- Condition of abdominal wall

- Peritoneum & Peritoneal cavity

- Stomach (wall condition, contents & smell) (Weight _____ gms.)

- Small intestines including appendix

- Large intestines & Mesentric vessels

- Liver including

gall bladder (wt. _____ gms)

- Spleen (wt. _____ gms.)

- Pancreas

- Kidneys finding & Wt. - Rt. _____ gms. & Lt. _____ gms.

- Bladder & urethra

- Pelvic cavity tissues

- Pelvic Bones

- Genital organs (Note the condition of vagina, scrotum, presence of foreign body, presence of foetus, semen or any other fluid, and contusion, abrasion in and around genital organs).

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5. SPINAL COLUMN & SPINAL CORD (To be opened where indicated)

OPINION

i) Probable time since death (keep all factors including observations at inquest)

ii) Cause & manner of death- The cause of death to the best of my knowledge and belief is :-

(a) Immediate cause -

(b) Due to -

(c) Which of the injuries are ante-mortem/post-mortem and duration if antemortem?

(d) Manner of causation of injuries

(e) Whether injuries (individually or collectively) are sufficient to cause death in ordinary course of nature or not ?

iii) Any other

SPECIMENS COLLECTED & HANDED OVER (Please tick)

a) Viscera (Stomach with contents, small intestine with contents, sample of liver, kidney (one half of each), spleen, sample of blood on gauze piece (dried), any other viscera, preservative used)

b) Clothes

c) Photographs (Video cassettes in case of custody deaths), finger prints etc)

d) Foreign body (like bullet, ligature etc.)

e) Sample of preservative in cases of posioning.

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f) Sample of seal

g) Inquest papers (mention total number & initial them)

h) Slides from vagina, semen or any other material

PM report in original, ____inquest papers, dead body, clothings and other articles (mention there) duly sealed (Nos. ___) handed over to police official _____ No. _____ of PS _____ whose signatures are herewith.

Signature : _____

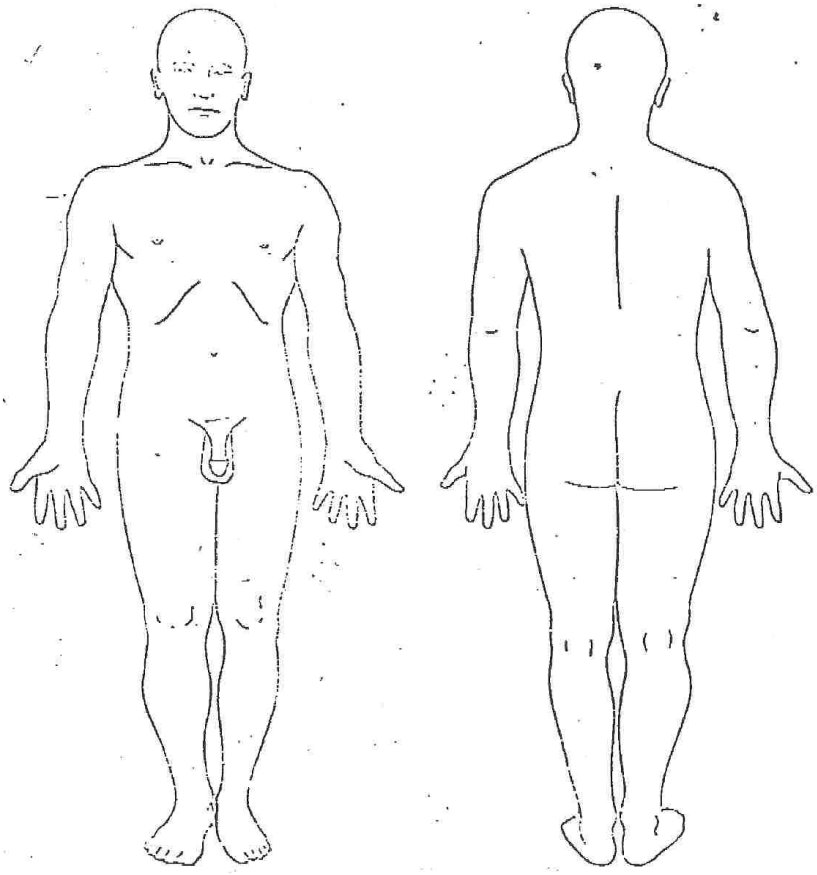
Name of Medical Officer _____

(in block letters) _____

Designation _____

SEAL

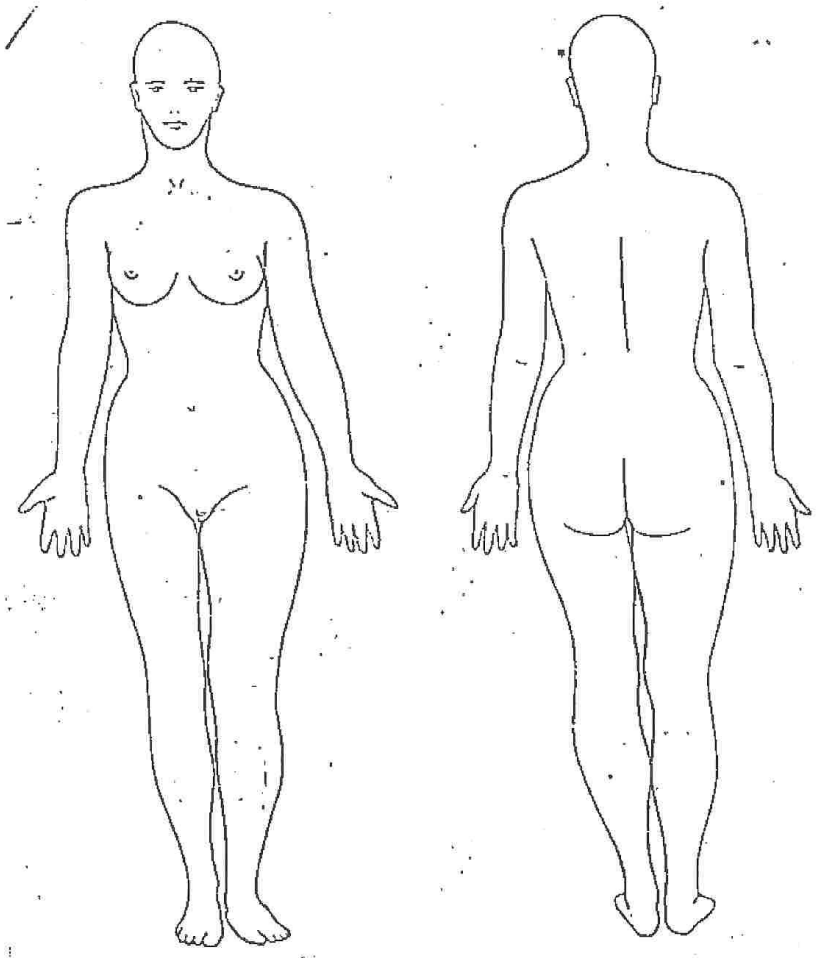
Full Body: Male-Anterior and Posterior Views (Ventral and Dorsal)



Name _____ Case No. _____

Date _____

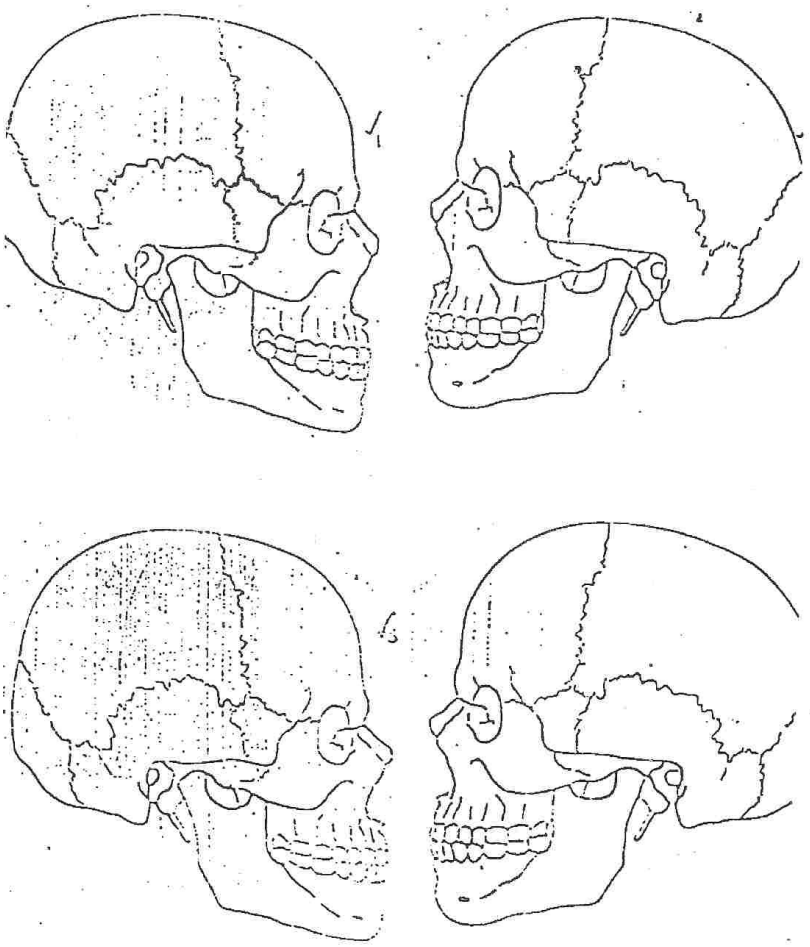
Full Body: Female-Anterior and Posterior Views

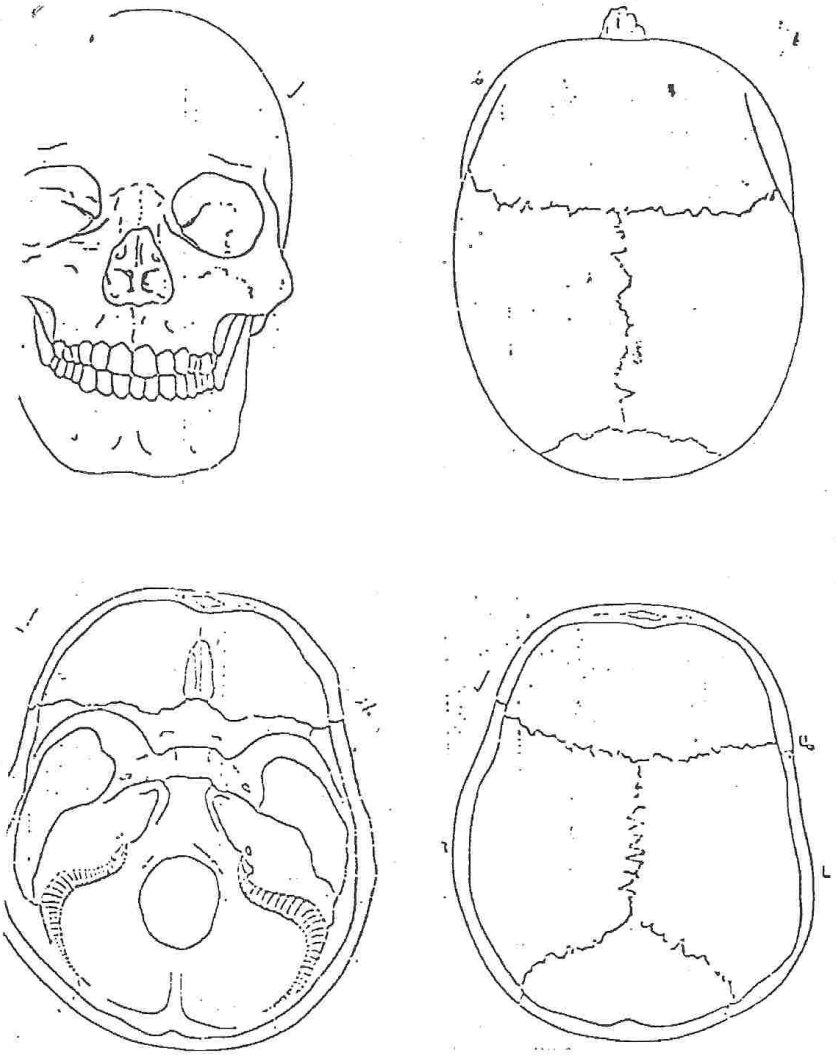


Name _____ Case No. _____

Date _____

Head - Surface and Skeletal Anatomy : Lateral view





Inner View of Skull

WOUND BALLISTICS

Ballistics is the study of motion of projectiles. It is studied under three sub heads-

1. **Interior Ballistics** - It concerns with the motion of projectiles inside the barrel of a firearm.
2. **Exterior Ballistics** – It is the study of the motion of projectiles in the open (air), after coming out of the muzzle of a firearm.
3. **Terminal Ballistics**- It is the motion / behaviour of the projectile at the target or inside the target. It is also known as Wound Ballistics.

Wound ballistics is concerned with the wounding phenomenon. It involves terminal ballistics. It studies how a projectile creates the wound and causes the destruction of tissues by its movements on and after entering the body, its travel inside and the exit from the body.

WOUNDING MECHANISM-

When a projectile strikes the human body, it depresses and compresses the skin, flesh and bone underneath. The continued pressure stretches them beyond the elastic limits and a hole is created. The stretched skin regains its normal state after the hole is created and the bullet has entered inside. The diameter of the hole on the skin, therefore appears, on the non-stretched skin somewhat smaller than the size of the projectile which created the wound, when it was stretched.

The minimum velocity required to penetrate the human skin has been found to be 40 to 50 metres per second. The threshold velocity for the penetration of a bone is 60 meter per second.

The projectile continues its onwards progress till it leaves the body through an exit hole, or, till its energy is spent beforehand, in overcoming the resistance. The projectile is found lodged at the end of the tunnel, in later cases.

ELEMENTS OF WOUND BALLISTICS-

Wound ballistics has following important elements-

1. Nature of target.

2. Velocity of projectiles.
3. Constructional features of projectiles.
4. Range.

FIREARM INJURIES-

The projectiles fired by firearm have certain shapes, velocities and kinetic energies which differ from most of the other agents causing injuries. The shapes of wound, the destructive effect on the tissues, presence of foreign bodies (of specific shapes and composition) and the projectile track help to identify whether the given injury is a firearm injury or not.

The evaluation of the injuries clarify if the given injury is-

1. a firearm injury or not.
2. an entrance wound or an exit wound.
3. post-mortem or ante-mortem injury.
4. from the alleged firearm.
5. fatal or not.
6. such that a person could perform the alleged acts after receiving the given injuries.
7. of alleged age.
8. caused from alleged distance.

The evaluation of injuries can also indicate of the alleged number of shots fired or the number of firearms used.

ENTRANCE WOUND-

The wounds have certain characteristics which permit their identification without difficulties, most of the times. The prominent features utilized for the purpose are-

1. The wounds are circular or oval in most of the cases. Key hole wounds are also formed by wobbling bullets.

2. The diameter of the entrance hole is, ordinarily slightly less than the diameter of the projectile creating the hole.
3. The edges are compressed inward – they are inverted.
4. A contusion ring is found around the wound in most of the times. The ring is dark red to bluish-black depending upon its age.
5. The dirt or wipe ring is not always present but whenever it is present, it is a sure sign of an entry wound.
6. Burning of skin, flesh or singeing of hair is caused when the shot is fired from a close range. The scorched skin, when it is available, it identifies the entry wound.
7. GSR deposits are from close range firing only. They also identify the entrance wound whenever they are available.
8. The presence of a muzzle impression around the wound.
9. Sometimes the bullet carries the GSR in their flight from the ejecta, from the barrel fouling and deposit on the edges or inside the entrance hole.

Extraneous deposits around the wound are from the following sources-

1. Propellant burned powder (smoke), semi burnt and unburnt propellant.
2. Primer residue.
3. Projectile, Cartridge Case and barrel material (from fouling and bore scraping).
4. Intermediate targets.

The extent of extraneous deposit depends upon-

1. The weapon.
2. The ammunition.
3. The range.
4. The angle of fire.
5. The target characteristics.

PINK COLORATION-

If a shot is fired from a very close range or in contact with the skin, some carbon monoxide (produced in the combustion of propellants) gets absorbed in the skin and flesh. It gives a pink coloration to the skin around the wound which indicates firearm injury and injury from a close range.

CHARRING, SCORCHING, BURNING, SINGEING etc.-

These are the effects of flame or hot gases produced in the combustion of propellants. The charring is caused when the shot is fired from a very close range. The size, shape and extent are characteristic of the firearm and range.

The Charring is often confused with the Blackening, Tattooing, Dirt Ring or even with Contusion Ring. The Charring is different from Blackening. The later can be removed with a cotton swab moistened with spirit while the former cannot be removed in this way.

BLACKENING-

The blackening is caused by the smoke deposits. The smoke particles are light. They do not travel afar. Therefore, smoke deposit i.e. blackening is limited to a short range. The colour of smoke is grey to black in black powder and light grey to dark grey in smokeless powder.

TATTOOING-

The tattooing is also known as peppering or stippling. It is the deposit of un-burnt or semi-burnt powder particles under the skin. Tattooing, ordinarily, cannot be removed with a swab.

DIRT RING OR PROJECTILE WIPE RING-

The dirt ring is deposited by some projectile around the wound.The materials come from-

1. The projectile may carry grease on them. The dirt gets collected on the grease which, in turn, gets deposited around the wound.
2. Deposit of soot/GSR present on bullet. The projectile pick up the soot/GSR from the powder ejecta which rush past the projectiles inside or outside the barrel.

3. Dirt due to intermediate target (clothes, mud walls etc.) or from the surface from which the projectile has ricocheted.

4. In shot gun ammunition, the pellets and buck shots are rubbed with graphite. A small amount of graphite is carried by the projectiles which they deposit around the entry hole. The lead bullets may also blacken the edges of the entry wound.

FOREIGN MATERIAL-

The projectile or their fragments and sometimes the wads are found inside the body, these may also indicate the nature of firearm used.

CONTUSION-

The edges of wound are contused by the impact of the projectile. The colour of contusion varies from reddish dark to bluish black. The contusions are in the form of a band around the wound and are often of uniform width. The tissues are ruptured and swollen.

EXIT WOUND-

All exit wounds, irrespective of range of firing, the following identifying features-

1. They have no fixed shape or size. Usually they are larger than entry wound and are irregular.

2. The eversion of edges and the direction of pushed or pressed out flesh, indicate the exit wound.

3. The presence of projectile, fixed in the exit wound.

4. If the entry wound is established and a probe through this wound comes out of another wound. The later is obviously an exit wound.

HANDELING FIREARM INJURIES-

1. Observe and record all major or minor, internal or external injuries.

2. Describe fully the wound of entrance, the internal track and the lodgement site or the exit wound. Give serial number to each injury. The description should contain (whenever possible)

(a) The possible nature of firearm.

(b) The presence or absence of GSR.

(c) The direction of fire and deflection (if any).

(d) The presence or absence of any extraneous matter or the projectile from the intermediate target or from the ricocheting surface.

(e) The condition of projectile : Whole ? Deformed ? Fragmented ?.

(f) Describe site(s) of the injury without using medical terminology.

3. Log all information collected through-

(a) Photographs – photograph the injury before and after cleaning, with a scale and an identification information chit included in the photographs. Photographs should fix the site of injury (ies) as well as nature of injuries (close up). If there is extraneous material (GSR etc.), it should be recorded photographically.

(b) X-Ray radiograph for locating projectiles and their fragments.

(c) Exhaustive description.

(d) X-Ray of bone damage.

4. Preserve relevant evidence-

(a) The clothes and the evidence thereon.

(b) The projectiles.

(c) The wads (if any).

(d) The extraneous deposit.

(e) In case of burning the charred skin piece may also be preserved.

(f) GSR found on hands must also be collected and preserved.

Get the help of Ballistic Expert, if required.

विधि विज्ञान प्रयोगशाला, उत्तर प्रदेश, लखनऊ–226 006

डीएनए परीक्षण हेतु

डी0एन0ए0 परीक्षण संबंधी दिशा निर्देश

नमूनों का संकलन/**संरक्षण**

(1) रक्त नमूने को स्वच्छ काटन गॉज/फिल्टर पेपर/एफटीए कार्ड पर सुखाकर कागज के लिफाफे में सील कर

भेजना वांछित है।

(2) 2 से 5 मिली रक्त सैम्पल सम्भावित माता-पिता एवं सन्तान से जीवाणुरहित इडीटीए वॉयल (अधिकृत मेडिकल स्टोर पर उपलब्ध) थर्मस के अंदर बर्फ में रखकर भेजना वांछित है।

(3) प्रत्येक रक्त सैम्पल अलग-अलग वायल में लिया जायेगा एवं उसके ऊपर लेवल पर न मिटने वाली इंक से विवरण अंकित किया जाये। लेबल पर सैम्पल लेने वाले चिकित्साधिकारी, विवेचनाधिकारी व गवाह जिसके समक्ष रक्त सैम्पल लिया गया है के हस्ताक्षर होने चाहिए तथा रक्त एकत्रण का दिनांक व समय अंकित होना चाहिए। लेबल को सैलोटेप से सुरक्षित किया जाये।

(4) पैतृक/मातृत्व विवाद संबंधी परीक्षणों में संम्भावित माता-पिता एवं सन्तान के रक्त सैम्पल तथा व्यक्ति की पहचान हेतु सगे-संबंधी जैसे माता-पिता, पति-पत्नी व बच्चों के रक्त सैम्पल भेजते समय प्रपत्र संख्या-2/2 दो प्रतियों में अलग-अलग भेजा जाये।

(5) एफटीए कार्ड को प्रयोग करते समय दस्तानों का प्रयोग करें तथा संदूषण (Contamination) से बचाये।

(6) एफटीए कार्ड पर सैम्पल दाता का नाम एवं अभियोग का विवरण, रक्त सैम्पल का संग्रहण दिनांक एवं समय, रक्त संकलन करने वाले चिकित्साधिकारी के हस्ताक्षर अंकित करें।

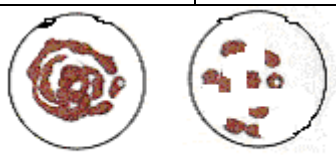
(7) एफटीए कार्ड पर छपे वृत्त में (< 125 µl प्रति 1 इंच वृत्त एवं 0.75 µl प्रति 3/4 इंच वृत्त) सैम्पल को सकेन्द्रित वृत्ताकार गति (Concentric circular motion) में डालकर छायादार स्थान पर 30 मिनट तक सुखाये। रक्त को कार्ड पर मत रगड़े एवं एक स्थान पर रक्त मत डालें।

(8) एक वृत्त में चार पॉच छोटी-छोटी बूँदे चित्रानुसार डालकर सुखाए।

(9) एफटीए कार्ड पर स्वच्छ सूखे अलग-अलग नमूने को अलग-अलग लिफाफे में रखकर डीएनए परीक्षण हेतु प्रयोगशाला भेजना सुनिश्चित करें। फॉरेंसिंक नमूनों को निम्न प्रकार से भेजना वांछित है:-

रक्त के धब्बे/ दॉत/बाल जड़ सहित हड्डियॉ/अस्थियॉ	प्रत्येक प्रदर्श को अलग-अलग सूखे स्वच्छ कपड़े अथवा कागज में लपेट कर भेजे। **पूर्णतया जली हड्डी व राख परीक्षण के लिए उपयोगी नहीं है।**

मुख स्वाब/ बैजाइनल स्वाब/एनल स्वाब	स्वच्छ रूई में सुखाकर, कॉच की वायल या शीशी में रखकर अथवा कागज के लिफाफे में रखकर भेजे।
मॉसपेशियॉ/ऊतक	100 ग्राम ऊतक/मांसपेशियॉ डीएनएस (मेडिकल स्टोर में उपलब्ध) अथवा नार्मल सैलाइन (0.9 प्रतिशत) कॉच अथवा प्लास्टिक की चौड़े मुँह वाली शीशी में संरक्षित कर भेजें। सूखा नमक (सोडियम क्लोराइड) अथवा बर्फ में फ्रीज कर संरक्षित किया जा सकता है। **उक्त सैम्पल को फार्मेलीन में संरक्षित नहीं किया जाना चाहिए।**



<u>सीलिंग एवं पैकिंग</u>

- प्रत्येक रक्त सैम्पल की वायल को लाख से सील कर अलग–अलग पारदर्शी पॉलीथीन में रखकर थर्मस फ्लास्क में बर्फ में रखकर 72 घण्टे में जॉच हेतु प्रयोगशाला में भेजा जाये।
- अन्य फारेन्सिक प्रदर्शों को लाख से सील कर अलग–अलग कर कागज के लिफाफे/कपडे के बण्डल में भेजा जाना वांछित है।

प्रपत्र डी0एन0ए0 परीक्षण–1/2/2011

विधि विज्ञान प्रयोगशाला, उत्तर प्रदेश, महानगर, लखनऊ–226 006

टेलीफोन नं0/फैक्स–0522–2336232

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अग्रसारण–प्रपत्र–डी0एन0ए0 परीक्षण

अभियोग संख्याः.....धारा.....थाना.....

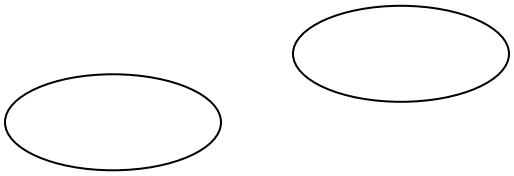
जनपद.....राज्य.....दिनांक.....

1. अभियोग का संक्षिप्त इतिहासः–

2. परीक्षण हेतु नमूनों का विवरणः–

क्र0 सं0	नमूना लिये जाने का दिनांक	नमूना देने वाले व्यक्ति का नाम	नमूने का स्रोत (सम्भावित माता, पिता, संतान, आदि)	टिप्पणी

3. नमूना सीलः–
(लाख की मुद्रा को सैलोटेप से कवर किया जाये)



विवेचनाधिकारी के हस्ताक्षर
नामः–.....

पदनामः–.....

दिनांकः–.....

अग्रेषण अधिकारी के हस्ताक्षर

नामः–.....

पदनामः–.....

दिनांकः–.....

क्रमशः

प्राधिकार पत्र

निदेशक, विधि विज्ञान प्रयोगशाला, उ0प्र0, महानगर, लखनऊ का अभियोग संख्या .....
.....धारा.....थाना.....

जनपद.....राज्य.....दिनांक.....

से संबंधित प्रेषित नमूनों को परीक्षण में उपयोग करने हेतु प्राधिकृत किया जाता है।

अग्रेषण अधिकारी के हस्ताक्षर

नामः–.....

पदनामः–.....

दिनांकः–.....

नोटः–

1. पुलिस अधिकारी जो पुलिस अधीक्षक के स्तर से कम न हो अथवा माननीय न्यायालयों द्वारा अग्रसारण किया जाना है। अभियोगों का अग्रसारण प्रपत्र–1 के अनुसार होना वांछित है।
2. नमूना सील लाख की पठनीय, प्रमाणित व सैलोटेप से सुरखित होनी चाहिए।
3. सभी अग्रसारित रक्त सैम्पल ठीक से चिन्हित, सील्ड हों एवं अग्रसारण प्रपत्र में उनका स्पष्ट उल्लेख होना चाहिए।
4. एफ0आई0आर0 (प्रथम सूचना रिपोर्ट)/मेडिकल रिपोर्ट की छायाप्रतियॉ आदि राजपत्रित अधिकारी द्वारा प्रमाणित होनी चाहिएं
5. डी0एन0ए0 फिंगर प्रिंटिंग परीक्षण हेतु भेजे गये रक्त सैम्पल सील्ड अवस्था में पॉलीथीन में रखकर बर्फ के साथ थर्मस फ्लास्क में सुरक्षित भेजे जायें।
6. प्रत्येक रक्त सैम्पल हेतु अलग–अलग प्रपत्र संख्या–2/2 दो प्रतियों में भरकर भेजना चाहिए।
7. प्रपत्र–1/2 व 2/2 अपूर्ण होने की स्थिति में अभियोग परीक्षण हेतु स्वीकार नहीं किया जायेगा।

विधि विज्ञान प्रयोगशाला, उत्तर प्रदेश, लखनऊ–226 006

टेलीफोन नं0/फैक्स–0522–2336232

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डीएनए परीक्षण हेतु

जैविक नमूनों का प्रमाणीकरण प्रपत्र

फोटोग्राफ

जीवित व्यक्ति का
डाक्टर द्वारा

(A) नमूने के स्रोत का विवरणः

1. नाम (स्पष्ट अक्षरों में).....
2. पिता/संरक्षक का नाम.....
3. लिंग..... 4. आयु..... वर्ष..... माह.....
5. पूरा पता.....

.....

.....

6. चिकित्सा/स्वास्थ्य विवरण

सामान्य..... रोग/दीर्घकालिक रोग .....

आनुवांशिक विकृति .....

7. रक्त आधान यदि कोई हुआ हो– विगत तीन माह में.: यदि हॉ तो दिनांक .....8. अंग प्रत्यारोपण, यदि कोई हो तो दिनांक–.....

(B) अभियोग परीक्षण हेतु ज्ञात संग्रहित नमूना

अभियोग सं0.....दिनांक.....थाना.....धारा.....

(C) डी0एन0ए0 परीक्षण का उद्देश्य.....

.....

.....

(D) जैविक नमूने के स्रोत/दाता द्वारा घोषणाः

मै.....एतद्द्वारा घोषणा करता/करती हूँ कि परीक्षण हेतु संग्रहित/संकलित जैविक नमूना (नमूने)..... .....मेरी सहमति एवं संज्ञान में लिया गया है तथा उपरोक्त सूचनायें सत्य है।

हस्ताक्षर .....

नाम .....

निशान अँगूठा बांया

निशान अँगूठा दाहिना

दिनांक.....

(E) (1) ज्ञात जैविक नमूनेः

❖ (2) प्रदर्श–

(I) तरल रक्त (II)रक्त के धब्बे/ रक्त रंजित प्रदर्श (III) मुख स्वाब

(IV) समूल बाल जड़ सहित (V) वीर्य (VI) योनि स्वाब

(VII) एनल स्वाब (VIII) कटे नाखून (IX) डिडयॉ

(X) शरीर द्वारा स्रावित अन्य स्राव के धब्ब (XI) दॉत/ इनेमल पल्प

(XII) ऊतक (XIII) अन्य

(XIII) व्यक्तिगत प्रयोग की जाने वाली सामग्री–

(i) कंघा (ii) अंतःवस्त्र (iii) लिपिस्टिक

(iv)चश्मा (v) रूमाल (vi) कलाई घड़ी

(vii) नाक एवं कान के आभूषण (viii) मोबाइल फोन

(ix) कन्डोम ☐

(F) जैविक नमूने का विवरणः

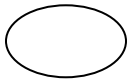
(1) रक्त परिरक्षण की मात्रा.....

(2) परिरक्षण में प्रयुक्त रसायन.....

(3) संकलन/परिरक्षण का दिनांक.....

(4) नमूना मोहर/सील की छापः.....

(लाख की मुद्रा को सैलोटेप से कवर किया जाये।)



चिकित्सक

हस्ताक्षर.....

नाम.....

पदनाम.....

रबर स्टैम्प.....

दिनांक.....

(G) विवेचनाधिकारी/गवाह का विवरण

जैविक नमूनों का संकलन/संग्रहण दो गवाहों की उपस्थिति में किया जाना अधिमान्य है।

विवेचनाधिकारी	गवाह 1:	गवाह 2:
	सम्मानित नागरिक	सम्मानित नागरिक
हस्ताक्षर.....	हस्ताक्षर.....	हस्ताक्षर.....
नाम.....	नाम.....	नाम.....
पदनाम.....	पदनाम.....	पदनाम.....
पता.....	पता.....	पता.....

दिनांक..... दिनांक..... दिनांक.....

मात्र कार्यालय प्रयोगार्थः–

अभियोग सं0.....

डीएनए परीक्षण..... प्रदर्श संख्या.....

वि0वि0प्र0 उ0प्र0, लखनऊ अभियोग प्राप्ति का दिनांक.....

- सीआरपीसी 1973 के सेक्शन– 53, 53 ए, 164 एवं 164 ए में उल्लिखित वर्ष 2005 में संशोधित दिनांक 23.06.2006 से प्रभावी है।