

Supporting documents for Forensic DNA Analysis Services

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Preface

Manual on “Forensic DNA Analysis Services” Prepared by the DNA Division, Central Institute of Forensic Science, Ministry of Justice (Thailand). This manual has been developed to provide information related to the provision of forensic DNA analysis services. It covers various aspects such as the scope of services, procedures for receiving physical evidence, and the timelines for DNA testing services. It also outlines the management of submitted specimens, the steps in forensic DNA analysis, recommendations for documenting evidence, appropriate containers or packaging for specimen collection, the chain of custody, and the types of evidence suitable for DNA analysis.

In addition, the manual offers guidance on proper practices prior to collecting specimens, as well as specific recommendations for storing different types of forensic evidence.

The purpose is to serve as a practical guide for those utilizing forensic DNA analysis services, ensuring that interested parties from the public sector, private sector, and general public can benefit from the information and apply it effectively.

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Table of Contents

Topic	Page
Preface	2
Table of Contents	3
List of Tables	4
List of Figures	5
Contact Information	6
Scope of Services	6
Forensic DNA Testing Service Process	7
Timeline for Forensic DNA Testing Service	7
Evidence Management	9
Forensic DNA Testing Service Process	9
Guidelines for Recording Evidence	10
Containers or Packaging for Samples	12
Chain of Custody for Evidence	12
Characteristics of Evidence Suitable for Genetic Testing	12
Recommendations Before Collecting Evidence	14
Guidelines for Collecting Different Types of Evidence	14
Guidelines for Collecting Different Types of Evidence	18
References	20

Print Date : 21/04/2026

List of Tables

Table	Page
Table 1: Timeline for Forensic DNA Testing Services	3
Table 2: Storage of Evidence at Appropriate Temperatures	9

Uncontrolled

List of Figures

Table	Page
Figure 1: Location of the DNA Division, Central Institute of Forensic Science	6
Figure 2: Laboratory Layout – DNA Division	19

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Print Date : 21/04/2026

DNA Laboratory
DNA Division
Central institute of Forensic Science

Contact Information: Central Institute of Forensic Science Operation Building 3, No. 111, Moo 4, Ban Mai Subdistrict, Mueang Pathum Thani District, Pathum Thani Province 12000

Phone Number: 081 909 0686

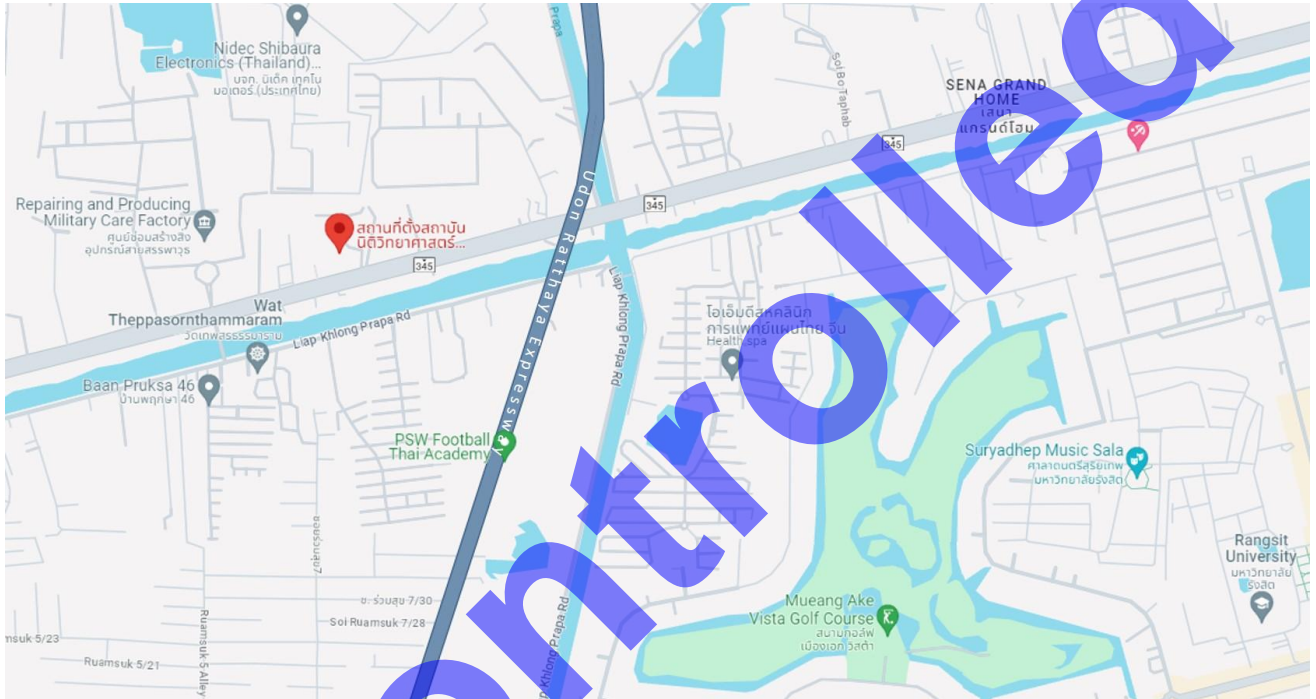


Figure 1: Location of the DNA Division, Central Institute of Forensic Science

1. Scope of Services

The DNA Division has been assigned the responsibility of conducting forensic DNA testing on evidence from various cases, including criminal cases, transnational criminal cases, missing persons, and unidentified bodies. The unit also performs DNA profile comparisons when requested by other government agencies. The obtained DNA profiles are stored in a genetic database for comparison, searching, and linking according to standard processes.

In criminal and transnational criminal cases, the database is used to compare and link evidence from crime scenes to suspects, which is valuable for investigation. The missing persons database is utilized to compare and establish genetic relationships and assist in identifying individuals. Additionally, DNA profile comparisons are made for investigation purposes or for legal use.

The unit also offers services in testing genetic relationships, such as paternity and maternity testing, parent-child relationships, sibling relationships, and kinship relationships that trace back to a

Print Date : 21/04/2026

common ancestor, either paternal or maternal. These services are used to prove genetic relationships and assist in legal matters.

2. Procedure for Receiving Evidence

2.1 Receipt of Physical Evidence

2.1.1 For evidence submitted from outside the Central Institute of Forensic Science, the assigned officer must accompany a forensic scientist from the Evidence Management Group, Division of Special Forensic Operations, to collect the evidence, following the designated route monitored by CCTV.

2.1.2 For evidence submitted within the Central Institute of Forensic Science, the assigned person must deliver the evidence to Operation Building 3, Evidence Submission Room, 4th Floor.

2.1.3 The officer must inspect the evidence to ensure that the packaging is intact, without any signs of tearing or damage, and that the evidence is properly sealed with the seal bearing a signature and date.

2.2 Rejection of Evidence

2.2.1 The evidence envelope is not sealed, lacks a signature and date, the packaging is damaged, or shows signs of tampering or opening.

2.2.2 The details on the evidence or barcode sticker do not match the information on the evidence submission form.

2.2.3 The evidence is broken or leaking.

2.2.4 DNA profile of the individual is already available in the DNA database.

2.2.5 It is not possible to issue the test results within the timeframe requested by the service user.

3. Timeline for Forensic DNA Testing Service

Table 1: Timeline for Forensic DNA Testing Services

No.	Specimens Type	Time (Term of Period)
1	Buccal Swab	17
2	Blood Stain	17
3	Blood	17
4	FTA Paper	17
5	Cotton Swab	17
6	Hair	17
7	Nail	17
8	Cigarette Butt	17
9	Tissue	17
10	Degraded Tissue	17
11	Bone	17
12	Teeth	17
13	Cloth	17
14	Shoes	17
15	Vaginal Swab	17
16	Condom	17
17	Bag	17
18	Weapon	17
19	Sticky Tape	17
20	Tooth Brush	17
21	Foam Tip	17
22	Others	17

Notes:

1. The number of items for testing should not exceed 20 items per case.
2. If the number of items for testing exceeds 20 per case, the service timeframe may be adjusted based on the number of items.
3. The service timeframe specified in the table above applies to one test method only.
4. If YSTR/XSTR testing is required, an additional 10 business days will be added to the service timeframe.
5. If mtDNA testing is required, an additional 25 business days will be added to the service timeframe.
6. Reports from external agencies requesting DNA profile comparison with the genetic database are categorized as item number 22 (Other).
7. The timeframe for providing DNA profile comparison results within the database is 25 business days.
8. The specified timeframe above assumes no emergencies, such as delays in reagent procurement, equipment malfunction, or urgent tasks outside the planned operations, which

Print Date : 21/04/2026

could impact the ability to meet the service standards outlined in the service manual. In such cases, only the requested report will be issued based on the available results.

4. Evidence Management

4.1 Transportation of Evidence: The assigned personnel will be responsible for transporting the evidence to the laboratory.

4.2 Receipt of Evidence: The process for receiving evidence will follow the procedures outlined in the forensic DNA testing service process.

4.3 Preservation of Evidence (Preservative): Details on the preservation of evidence are outlined in **Table 2**.

4.4 Handling of Evidence After Testing : Once the forensic DNA testing has been completed and the results are issued, the evidence will be returned to the service requester upon request. If the service requester does not wish to receive the evidence back, the laboratory will store the evidence for a period of 4 months. After this period, any stored evidence will be disposed of according to the prescribed procedure.

Table 2: Storage of Evidence at Appropriate Temperatures

No.	Type of specimen	Temperature
1	Buccal swab, FTA paper, Cotton swab, Cigarette butt, Cloth, Shoes, Weapon	Room temperature
2	Blood, Blood stain, Hair, Nail, Vaginal swab, Condom,	4 Degree Celsius
3	Tissue, Bone, Teeth	-20 Degree Celsius

5. Forensic DNA Testing Service Process

5.1 Sampling Test for DNA

5.2 DNA Extraction

This is the process of extracting genetic material from cells and dissolving it in a solvent. The method varies depending on the type of sample.

5.3 Quantification of Genetic Material

This step involves measuring the amount of genetic material to determine if it is sufficient for amplification.

5.4 Genetic Material Amplification

This technique is used to increase the number of copies of a specific region of genetic material.

5.5 Separation of Amplified Genetic Material by Electrophoresis

This technique separates genetic material by size using an electric field on a medium.

Print Date : 21/04/2026

5.6 Analysis of Genetic Material Patterns and Reporting of Results

5.7 Storage and Comparison of Genetic Material Patterns in a Database

5.8 Preparation of the Test Report

6. Guidelines for Recording Evidence

6.1 General Characteristics of Evidence

The information to be recorded must include at least the following details: type of evidence, necessary description of the evidence, and quantity of evidence. For example:

6.1.1 Cotton swab from the inner cheek of Mr./Miss Rakchat Chaiyo, claimed to be the son/father/mother, 2 stick

6.1.2 Cotton swab from the inner cheek of Mr. Rakchat Chaiyo, ID card number, 2 sticks

6.1.3 Cotton swab from blood sample of Mr. Rakchat Chaiyo, ID card number, 2 sticks

6.1.4 Blood sample of Mr. Rakchat Chaiyo, corpse number, 1 vial

6.1.5 Bloodstain sample wiped from the window at the crime scene, 1 piece/2 sticks

6.1.6 FTA paper for inner cheek cells of Mr. Rakchat Chaiyo, 1 sheet

6.1.7 Cotton swab from the motorcycle handle/cleaning of suspected stain, 2 sticks

6.1.8 Hair or fur strands collected from the crime scene/floor of Mr. Rakchat Chaiyo, 2 strands/envelope

6.1.9 Left/Right fingernails of Mr. Rakchat Chaiyo, corpse number, 5 pieces/envelope

6.1.10 Cigarette butts collected from in front of the house at the crime scene, 10 pieces

6.1.11 Meat sample of Mr. Rakchat Chaiyo, 2 pieces/envelope

6.1.12 Thigh/Chest bone of an unidentified corpse/Mr. Rakchat Chaiyo, corpse number, 2 pieces

6.1.13 Teeth of an unidentified corpse/Mr. Rakchat Chaiyo, corpse number, 2 teeth

6.1.14 Mattress stained with suspected substances, 1 piece

6.1.15 Green short-sleeved T-shirt/black long sweatpants, 1 set

6.1.16 Brown slippers, 1 pair

6.1.17 Cotton swab from the vaginal area of Miss Rakdee Chaiyo, 2 sticks

6.1.18 Condom collected from the floor at the crime scene, 1 piece

6.1.19 Rope/bag/sack collected from the house at the crime scene, 1 bag

6.1.20 Knife/sword stained with blood collected from the house at the crime scene, 1 piece

Print Date : 21/04/2026

6.1.21 Adhesive tape collected from an explosive device, 1 piece/envelope

6.1.22 Toothbrush collected from the house at the crime scene, 1 piece

Note: Any cases outside of the above should be at the discretion of the person collecting the evidence.

6.2 Reasons for Forensic Testing

6.2.1 To determine if human blood stains are present

6.2.2 To determine if semen stains or sperm are present

6.2.3 Genetic Testing

- 1) To compare genetic patterns with evidence from case number.....
- 2) To compare genetic patterns with evidence number
- 3) To compare genetic patterns with a genetic database (e.g., suspect, defendant)
- 4) To store in a genetic database (e.g., Deep South Officer: DSO)
- 5) To store for future comparison (e.g., awaiting additional evidence)
- 6) To compare paternal, maternal, and offspring relationships
- 7) To compare father/mother and offspring relationships
- 8) To compare sibling relationships from both parents
- 9) To compare sibling relationships from one parent
- 10) To compare relationships from a single paternal or grandfather line (e.g.,

between grandfather and grandson)

11) To compare relationships from a single maternal or grandmother line (e.g., between grandmother and grandson/granddaughter)

6.2.4 To compare genetic patterns with documents in the genetic database (please assign one number per genetic pattern)

6.2.5 To perform genetic testing for Proficiency Testing/Interlaboratory comparison/Competency Testing/Quality Control

Note: For genetic testing cases outside of the above, approval from the laboratory head or assigned person must be obtained before submission to the laboratory.

6.2.6 Additional Notes (if any)

Include any additional information the sender believes is necessary for the testing process.

6.2.7 Chain of Custody

1) Evidence Number: Record the evidence number for each piece, along with the person and date/time of handling.

2) Sender Information: The sender must clearly indicate their name and date/time of submission.

3) Receiver Information: The receiver must clearly indicate their name and date/time of receipt.

Print Date : 21/04/2026

7. Containers or Packaging for Samples

The packaging of evidence should be sealed to prevent contamination or damage. The sample's condition should be maintained according to the specific requirements of the test, such as refrigeration/ice or room temperature, during transport. For forensic genetic sample tests, the following containers should be used depending on the type of sample:

- 7.1 Glass or plastic tubes sealed with rubber stoppers containing anticoagulant (EDTA)
- 7.2 Glass or plastic tubes containing fresh and wet samples (e.g., liver, spleen, tissue)
- 7.3 Paper envelopes of various sizes for lightweight and dry items (e.g., cigarette butts, clothes, shoes, cans)
- 7.4 Cardboard boxes of various sizes for heavier dry items (e.g., weapons, knives, guns)
- 7.5 Plastic bags of various sizes for fresh and wet items (e.g., meat, bones, teeth)

Note: The container used should be chosen based on the type, size, and quantity of the sample. The container must be dry, clean, and sterile. Each submission form should be kept separate from the sample containers to avoid contamination.

8. Chain of Custody for Evidence

8.1 The laboratory receives evidence through the FSSC system of the Forensic Science Institute.

8.2 The laboratory accepts evidence into the testing area via the Rapid DNA system to maintain control over the chain of custody of the evidence.

8.3 The evidence will be stored in a designated evidence storage cabinet in a controlled access area, where access is restricted through an Access Control system. Only authorized personnel are allowed to enter.

8.4 Once the forensic analysis is completed, the evidence will be returned to the requesting party (upon their request) after the test report has been finalized. If the requesting party does not wish to retrieve the evidence, the laboratory will retain the evidence for 4 months. After this period, any remaining evidence will be destroyed.

9. Characteristics of Evidence Suitable for Genetic Testing

9.1 Fresh Blood Samples from the Deceased or Reference Individuals

1. At least 2-3 milliliters of blood.
2. Use EDTA as an anticoagulant.
3. Use cold packs to preserve the sample during transport.
4. The sample must not be broken or spilled to avoid contamination with other samples.

Print Date : 21/04/2026

9.2 Dried Blood Samples on Cotton Swabs, Cotton Balls, Filter Paper, FTA Paper, Tissue Paper, Gauze, Clothing, or Other Absorbent Materials

1. Package in a paper envelope.
2. The sample must be dry, not wet or moist.
3. No blood stains should leak onto the envelope.
4. Dry blood powder or flakes should be wrapped in paper and placed in a paper envelope.

9.3 Cotton Swabs for Buccal Swabs, Saliva, Vaginal Swabs, or Other Secretions

1. Package in a paper envelope.
2. The sample must be dry, not wet or moist.
3. No stains should leak onto the envelope.

9.4 Secretions Collected on Glass Slides

1. Package in a paper envelope where the sample cannot move, preventing any scratching or loss.
2. The sample must be dry, not wet or moist.
3. No stains should leak onto the envelope.
4. The glass slide should not be permanently sealed.

9.5 Secretions on Various Objects

1. Package in a paper envelope where the sample cannot move, preventing any scratching or loss.
2. The sample must be dry, not wet or moist.
3. No stains should leak onto the envelope.

9.6 Cigarette Butts, Chewing Gum, Toothbrush

1. Package in a paper envelope.
2. The sample must be dry, not wet or moist.
3. No stains should leak onto the envelope.

9.7 Hair/Fur Strands

1. Package in a paper envelope.
2. The sample must be dry, not wet or moist.
3. No stains should leak onto the envelope.
4. Use cold packs to preserve the sample during transport.

9.8 Tissue Samples

1. Fresh muscle tissue, 1-2 cubic inches in size.
2. Package in a tightly sealed plastic bottle, without formalin.
3. Use dry ice to preserve the sample during transport.

Print Date : 21/04/2026

9.9 Bones

1. Long bones, such as femur or fibula, approximately 3-5 inches long or at least 5 grams in weight.
2. Dry bones should be packaged in a paper envelope, and wet bones should be packaged in a plastic bag.
3. Use dry ice to preserve the sample during transport.

9.10 Teeth

1. Dry teeth should be packaged in a paper envelope, while wet teeth should be packaged in a plastic bag.
2. Use dry ice to preserve the sample during transport.

Teeth Most Suitable for Forensic Testing:

1. Non-restored molars
2. Non-restored premolars
3. Non-restored canines
4. Non-restored front teeth
5. Restored molars
6. Restored premolars
7. Restored canines
8. Restored front teeth
9. Teeth that are not decayed to the root

9.11 Fecal Samples

1. Package in a tightly sealed plastic bottle and freeze.
2. Use dry ice to preserve the sample during transport.

10. Recommendations Before Collecting Evidence

- 10.1 Always wear clean gloves before handling evidence.
- 10.2 Change gloves every time before collecting a new piece of evidence.
- 10.3 Package the evidence in clean and appropriate containers based on the type of evidence.

11. Guidelines for Collecting Different Types of Evidence

11.1 Buccal Swab

11.1.1 In cases where there is a victim or suspect, and genetic material is needed to compare with evidence from other sources, follow these steps:

Use a sterilized cotton swab to wipe the inside of the person's cheek.

1. Allow the swab to air dry for approximately 3 minutes.

Print Date : 21/04/2026

2. Store it in a paper envelope or box, ensuring each person's sample is kept separate to prevent contamination.

3. Store at room temperature.

11.1.2 If using FTA paper collection kits for genetic samples, follow these steps:

1. Use a foam-tipped swab and hold the handle, avoiding touching the tip where the sample will be collected.

2. Insert the swab into the mouth and rub both sides of the tip inside the cheek for about 1 minute. Try to absorb as much saliva as possible.

3. Press the foam tip onto Circle 1 of the FTA paper, holding it for about 10 seconds, then flip the tip and press it again until the paper changes color. Dispose of the swab.

4. Repeat steps 1-3 with a new swab and place it on Circle 2.

5. Allow the FTA paper to dry and then store it in a paper envelope with a moisture-absorbing packet.

6. Store at room temperature.

11.2 Fresh Blood or Blood Stains

11.2.1 Fresh Blood from a Person

1. Fresh blood collection must only be performed by authorized medical personnel.

2. Collect at least one tube of blood (3 mL) and add EDTA to prevent clotting.

3. Store at 4°C.

11.2.2 Liquid Blood at the Scene

1. Use a sterile syringe or small pipette to collect the blood, transferring it into a sterile container (never use the mouth to draw blood).

2. For blood clots (e.g., blood clots), use a spatula to collect them and place in a sterile container.

3. If no other tools are available, use a cotton ball or swab to collect the blood, avoiding lymph areas. Allow the sample to air dry, but do not expose to direct sunlight.

4. Collect the sample in a paper envelope or box (one sample per container).

5. Store at 4°C.

11.3 Wet Blood Stains

11.3.1 Blood Stains on Clothing

1. Dry the clothing on a clean surface or hang it to air dry. Avoid direct sunlight or using heat sources like hairdryers, as this can degrade the evidence.

2. Never store wet clothing in airtight containers or plastic bags, as this can lead to moisture buildup and bacterial growth.

Print Date : 21/04/2026

3. Once dry, store the clothing in a paper container.
4. Seal and label the container with the necessary details.
5. Store at 4°C.

11.3.2 Small Items with Wet Blood Stains

1. Air dry small items with wet blood stains and store in a paper envelope, making sure the stain stays intact.
2. For large items that cannot be moved, use a sterile cotton swab to collect the blood stain, allow it to dry, and store in a paper box.
3. Seal and label the container.
4. Store at 4°C.

11.4 Dry Blood Stains

11.4.1 Dry Blood on Moveable Objects

Collect the object with the blood stain and store it in a clean paper container, ensuring each item is separated and labeled with the following details: description, location, collector's name, date, and time of collection.

11.4.2 Dry Blood on Non-Absorbent Surfaces (e.g., concrete walls)

1. Take photos, make notes, and sketch the stain's appearance.
2. Use a clean blade to scrape the blood stain onto a clean sheet of paper.
3. Fold the paper and seal it in an envelope, signing the seal.

11.4.3 Dry Blood on Large Non-Moveable Items (e.g., walls, floors)

1. Record details, take photos, and sketch the stain's appearance.
2. Use a clean blade or cotton swab with distilled water to collect the blood stain, ensuring no contamination.
3. Dry the sample and store it in a paper envelope.
4. For blood flakes, scrape and collect them directly into a paper envelope
5. Seal the envelope and label it.
6. Store at 4°C.

11.5 Semen and Semen Stains

11.5.1 Initial Detection of Semen Stains:

1. Semen stains may appear as drops, patches, or sticky spots on clothing, which harden over time.
2. To detect semen on clothing, use UV light. If the substance is semen, it will fluoresce under UV light. (Note: Detergents may also fluoresce, so be cautious.)

11.5.2 Semen Found at the Crime Scene

1. Record all details (photos, video, notes, and sketches) of the semen found.

Print Date : 21/04/2026

2. Use a clean syringe or pipette to collect the semen into a sterile container (never use your mouth).

3. Store at 4°C.

11.5.3 Semen Stains on Moveable Objects

1. If the object with semen stains is small (e.g., clothing), store it as is in a clean container.

2. If there are wet semen stains on the clothing, air dry them before packaging.

3. Each item must be stored separately in paper containers.

4. Store at 4°C.

11.6 Tissue, Organs, or Bone Fragments

11.6.1 Fresh Tissue, Organs, or Bone Fragments

1. Record the details and take photos.

2. Use sterile forceps to handle the tissue or bone fragments.

3. Place the samples in clean containers, without preservatives.

4. Seal the containers and label them with all necessary details.

5. Store at -20°C.

11.6.2 Old Tissue, Organ, or Bone Fragments

1. Record details, including photos and sketches of the samples.

2. Package the items in clean containers, seal them, and label them.

3. Store at room temperature.

11.7 Urine, Saliva, and Other Body Fluids

11.7.1 Liquid Samples (Urine, Saliva, etc.)

1. Collect the fluid in sterile containers (e.g., plastic or glass bottles) as soon as possible.

2. Seal and label the container with all necessary details.

3. Store at 4°C.

11.7.2 Fluid Stains on Objects

1. If body fluid stains (e.g., urine, saliva) are found on objects, collect them as they are or scrape them from the surface.

2. Place the sample in a paper envelope, then into a clean paper container.

3. Seal and label the container.

4. Store at 4°C.

11.8 Hair and Fur Samples

11.8.1 Hair Collection

1. Use sterile forceps to collect hair, ensuring the root is intact if possible.

Print Date : 21/04/2026

2. Handle hair samples carefully to avoid damage to the root or any attached body fluids.

3. Air dry the hair if body fluids are present before packaging.

4. Place each hair sample into a separate paper bag.

5. Seal and label the container with the appropriate details.

6. Store at room temperature.

12. Procedures in Case of Fire or Earthquake

In the event of a fire or earthquake within the organization, being well-prepared and responding appropriately can significantly reduce risks to life and property. The procedures can be categorized based on different scenarios as follows:

12.1 In Case of Fire

Before the Incident: Study the organization's emergency plan. Know the locations of: Fire exits, Fire extinguishers, Assembly points. Regularly participate in fire drills and evacuation training.

During the Fire:

1. Stay calm.
2. Notify responsible personnel or call emergency services (e.g., 199).
3. If the fire is small and controllable, use the appropriate fire extinguisher.
4. Evacuate the building immediately via the fire escape route. Do not use elevators. If smoke is present, stay low or crawl, and cover your nose and mouth with a damp cloth.
5. Assist those in need only if it is safe to do so.
6. Proceed to the designated assembly point.

12.2 In Case of Earthquake

Before the Incident:

1. Be familiar with the earthquake emergency response plan.
2. Identify safe spots such as under sturdy desks or next to strong walls.
3. Secure heavy items on high shelves.

During the Earthquake:

1. Stay calm.
2. If indoors: Avoid windows, glass, and hanging objects. Take cover under a sturdy desk or piece of furniture. Protect your head and neck with your arms. Do not rush outside while the building is still shaking.

Print Date : 21/04/2026

3. If outdoors: Stay away from buildings, utility poles, and large trees.
4. Wait until the shaking stops before evacuating to a safe area.

After the Incident:

1. Check for injuries and provide basic first aid if necessary.
2. Do not re-enter the building until it has been declared safe.
3. Report the incident to responsible authorities.

แผนผังห้องปฏิบัติการ กองสารพันธุกรรม



Figure 2: Laboratory Layout – DNA Division

Print Date : 21/04/2026

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Print Date : 21/04/2026