

Lecture 2

Crime scene



by
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What is a crime scene?

- A crime scene is any physical scene, anywhere, that may provide potential evidence to an investigator.
- It may include a person's body, any type of building, vehicles, places in the open air or objects found at those locations.
- “Crime scene examination” therefore refers to an examination where forensic or scientific techniques are used to preserve and gather physical evidence of a crime.



Types of Crime Scene

- Based on evidence found on the crime scene:

1. Primary Crime Scene

The crime scene where the actual crime occurred or where more usable pieces of evidence were found is known as the primary crime scene. For example, A murder scene, theft, assault, etc.

2. Secondary Crime Scene

The crime scene which is some or another way related to the crime but is not a place where the actual crime is committed is known as a secondary crime scene. It is very important because it may provide a strong link between the suspect and the victim.

For example, In a murder case where murder is done at one place and the body is dumped in a different place.

Based on the geographical location of the crime scene:

1. Outdoor crime scene

A crime that is committed in an open and wide area like a field, park, road, playground, etc. is known as an **outdoor crime scene**. An outdoor crime scene is more vulnerable to loss or contamination of evidence by sunlight, air, or extreme weather.



2. Indoor Crime Scene

A crime that is committed in an enclosed and small area like a room, hall, corridor, kitchen, etc. is known as an **indoor crime scene**. An indoor crime scene is less vulnerable to loss or contamination of evidence by weather condition as it occurred in an enclosed area.

3. Mobile/ Conveyance Crime Scene

Conveyance is a means of transportation. Types of crimes committed in conveyances include the following: Vehicle, Train/Bus, Lift, Flight. Physical evidence recovered from these scenes may extend well beyond the conveyance.



What can constitute evidence?

A fundamental principle of forensics is that every contact leaves a trace. This may be contact of a person with a person, contact of a person with a vehicle or location, or of a vehicle with a location etc.

Evidence at crime scenes may include:

- Biological samples such as DNA from blood, semen, saliva and breath, hair, fingerprints and body part prints, urine, teeth.
- Fibres such as pieces of material torn from clothing, or pieces of weapons broken during an attack.
- Photographs, videos, drawings and plans.
- Documentary evidence such as receipts, travel tickets or bank statements.

Contamination of crime scene

Contaminated evidence is any foreign material that is introduced to a crime scene after the crime is committed.

- Ex.
- DNA contamination, resulting from improper crime scene procedures or laboratory practices, can severely compromise the quality of evidence, leading to wrongful convictions or acquittals

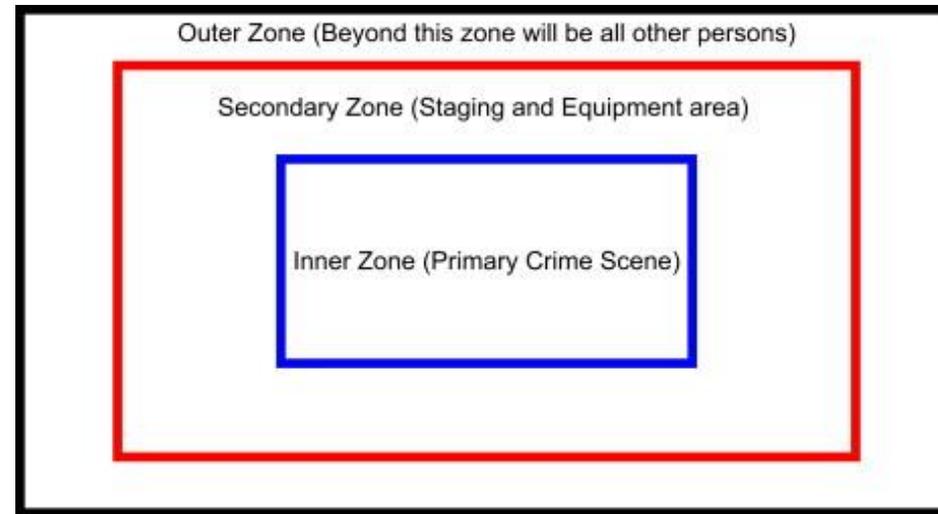
Securing the crime scene

- A very simple action that investigators in any country can take is to make sure their staff are aware of the need to secure a crime scene.
- Investigators should do all they can to ensure that scenes (including the victims as well as the locations and the evidence at that location) are not interfered with, and to allow adequate time to strategize the “forensic examination”.
- Interference—leading to “forensic contamination”—can be avoided by simple measures:

1. Controlling access to scenes
2. Covering scenes
3. Keeping records of everyone who has had access to a scene
4. Taking fingerprints and DNA samples from staff before they are allowed to get to a scene
5. Providing guidance in the packaging of recovered material, to prevent deterioration or contamination

1. Controlling access to scenes

is a fundamental procedure involving establishing a clear perimeter with barriers, maintaining a single point of entry and exit, keeping a detailed log of all individuals entering or leaving, and designating specific access paths for personnel like investigators and medical staff.



Perimeters



Caution perimeter strips

- **Physical Barriers and Perimeters**

- 1. Establish Boundaries:**

Use physical barriers such as crime scene tape, barricades, or natural features (like walls or buildings) to define the outer perimeter of the scene.

- 2. Mark Entry/Exit Points:**

Clearly establish and secure a single point of entry and exit for the scene to control who goes in and out.

- 3. Consider Outdoor Scenes:**

Be aware that outdoor scenes often have multiple potential access points and will require more officers to secure a larger area effectively.

Controlling Personnel Access

Keeping records of everyone who has had access to a scene:

1. The Crime Scene Log:

Assign an officer to manage the single access point and maintain a crime scene log.

2. Log Entries:

The log must record the names of everyone who enters or exits, the reason for their entry, their entry and exit times, and their duties.

3. Authorized Personnel Only:

Ensure only authorized personnel, such as investigators, medical staff, and essential support personnel, are allowed into the secured area.

4. Separate Individuals:

Keep suspects, witnesses, victims, and their families separated at the scene.

Common Errors in Crime Scene Handling

1. Inadequate Training

A. Lack of Proper Education and Continuous Training:

One of the primary reasons for DNA contamination at crime scenes is the inadequate training of crime scene investigators. Many officers do not receive comprehensive education on the latest forensic techniques and protocols, leading to significant errors in evidence handling. Studies have shown that first responders often lack sufficient training, resulting in mistakes during the early stages of crime scene management [1]. Proper training must incorporate both theoretical knowledge and practical skills to reduce these errors. Continuous education, including regular workshops, simulation exercises, and certification programs.

B. Importance of Specialized Training for Crime Scene Units

Specialized training programs focusing on DNA evidence collection and contamination prevention are essential for equipping crime scene investigators with the expertise needed to handle complex evidence scenarios. Continuous education ensures that forensic scientists and crime scene units stay informed about advancements in forensic

2. Improper Use of Personal Protective Equipment (PPE)

A. Failure to Wear Appropriate PPE: Failure to wear appropriate PPE, such as gloves, masks, and protective clothing, significantly contributes to DNA contamination at crime scenes.

Research shows that even minimal contact by investigators can transfer sufficient DNA to contaminate critical evidence.

B. Cross-Contamination Due to Inadequate PPE Usage:

Improper handling practices, such as touching multiple surfaces with the same gloves or failing to change gloves between tasks, can lead to cross-contamination of DNA evidence. Cross-contamination compromises evidence integrity, rendering it unreliable for forensic analysis

3. Poor Scene Preservation

A. Not Securing the Crime Scene Adequately

Poorly secured crime scenes are highly susceptible to contamination from unauthorized personnel, environmental factors, and mishandling by investigators. Research emphasizes that effective barriers and restricted access are essential for preserving evidence integrity. Crime scenes are best secured by establishing controlled entry and exit points, marked with crime scene tape and reinforced by physical barriers to prevent unauthorized access. Crime scene management should also incorporate the use of visible signage, security personnel, and technologies, such as surveillance cameras and motion detectors, to monitor and control access.

B. Unauthorized Personnel

Access: Unauthorized personnel access to crime scenes poses significant risks to evidence integrity, especially when DNA is involved. Allowing untrained or non-essential personnel to enter the crime scene can lead to contamination, making it difficult to analyze and interpret the evidence accurately.

Errors During Evidence Collection

1. Improper Collection Techniques

A. Use of Incorrect Tools and Techniques

Using incorrect tools or techniques during evidence collection is one of the primary causes of contamination. For example, non-sterile swabs, containers, or collecting samples in non-sterile environments can introduce contaminants that alter DNA or other biological evidence.

B. Lack of Sterile Collection Methods

Maintaining sterile conditions during evidence collection is critical to preventing contamination. This includes the use of new gloves, sterile swabs, and clean containers for each piece of evidence collected.

2. Contamination from Crime Scene Personnel

- A. DNA Transfer from Investigators:** DNA transfer occurs when investigators inadvertently introduce DNA from themselves or other sources onto evidence, often through direct contact, respiratory droplets, or contaminated tools. This can happen in two ways: direct DNA transfer and indirect (secondary) DNA transfer.
- Direct transfer occurs when DNA is transferred directly from the person handling the item, such as when an investigator touches an object and leaves their DNA behind. In contrast, indirect (secondary) DNA transfer involves the DNA being transferred via an intermediary, for example, when DNA from an object is picked up on gloves and subsequently transferred to another object.
 - Research consistently highlights DNA transfer as a significant issue in forensic investigations, one that can severely compromise the integrity of forensic evidence.

B.Human Error and Mishandling of Evidence: Human error, including mishandling evidence or failing to follow established protocols, is a common cause of DNA contamination in forensic investigations. These errors can occur at any stage of the evidence collection process, from initial recovery to packaging and transportation. Studies indicate that improper handling, such as failing to change gloves or using non-sterile tools, can compromise the integrity of the evidence, ultimately affecting investigative outcomes [28,29]. To minimize human error, crime scene units must enforce strict adherence to protocols.

B. Presence Of Contaminants in the Scene: Environmental contaminants, including dirt, dust, pollen, and biological material from animals, pose significant risks to the integrity of forensic evidence. These contaminants can obscure or degrade biological samples, making them difficult to analyze. Identifying and mitigating these factors is crucial for preserving evidence. Conducting a pre-scene assessment allows investigators to identify potential contamination sources and plan their evidence collection strategy accordingly. To reduce contamination risks, crime scene units should implement environmental controls, such as air filters, decontamination stations, and sensors that monitor changes in temperature, humidity, or airborne particles. Collaboration with forensic experts, including forensic entomologists and environmental scientists, can provide valuable insights into managing environmental contaminants and developing specialized protocols for different surfaces.

Errors During Evidence Packaging and Transportation

1. Incorrect Packaging

A. Use of Non-Sterile Packaging Materials:

Packaging evidence in non-sterile materials significantly increases the risk of contamination. Non-sterile packaging can introduce foreign DNA or contaminants, leading to the degradation of sensitive evidence, such as biological samples, and potentially rendering it unusable in court.

B. Inappropriate Sealing and Labelling:

Proper sealing and labeling of evidence are critical to preventing contamination and maintaining the chain of custody. Improper sealing allows contaminants to enter the packaging, particularly during transportation and storage.

2.The Appropriate Packaging

The choice of packaging materials is crucial for preserving biological evidence. Inappropriate packaging—such as non-breathable plastic bags—can lead to contamination, degradation, or loss of vital forensic information. Research suggests that biological evidence, particularly blood-stained fabrics or organic materials, should be packaged in breathable materials (e.g., paper bags, cardboard boxes) to prevent mold, bacteria, and other microorganisms from compromising DNA samples. Paper bags are often recommended for packaging biological evidence because they allow moisture to escape, preventing the buildup of humidity inside the package.

EVIDENCE-
(TO BE OPENED BY AUTHORIZED PERSONNEL ONLY)

Submitting Agency: _____ Item No.: _____
Case No.: _____
Date of Collection: _____ Time of Collection: _____
Collected by: _____ Badge No.: _____
Description of Enclosed Evidence: _____
Location Where Collected: _____
Type of Offense: _____
Victim's Full Name: _____
Suspect's Full Name: _____
Bag Sealed by: _____ Badge No.: _____

-CHAIN OF CUSTODY-

From	To	Date

Recorder No.: EPB-1
TRITECH FORENSICS
800.438.7884 • tritechforensics.com

-EVIDENCE-
(TO BE OPENED BY AUTHORIZED PERSONNEL ONLY)

Submitting Agency: _____ Item No.: _____
Case No.: _____
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Suspect's Full Name: _____
Bag Sealed by: _____ Badge No.: _____

-CHAIN OF CUSTODY-

From	To	Date

Recorder No.: EPB-3
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3. Transportation Issues

A. Exposure to Contaminants During Transport

During transport, evidence can be exposed to various contaminants, which can compromise its integrity if not properly protected. Research underscores the importance of using sealed, tamper-evident containers to safeguard evidence from external contaminants. These containers are essential in preventing unauthorized access and protecting evidence from environmental factors such as dust, moisture, or biological contaminants

B. Lack of Temperature Control: Certain types of biological evidence, including DNA samples, bodily fluids, and tissues, require specific temperature conditions to prevent degradation. Failure to maintain proper temperature control during transport can lead to the breakdown of biological materials, rendering them unusable for forensic analysis. Research highlights the importance of using portable refrigeration units and temperature-monitoring devices to ensure that evidence is consistently kept within the required temperature range during transportation

Laboratory Processing Errors

1. Contamination in the Lab

A. Inadequate Lab Cleanliness and Sterilization: Maintaining strict cleanliness and sterilization standards in forensic laboratories is crucial for preventing contamination, which can compromise DNA evidence integrity.

Cross-contamination due to inadequate lab cleanliness can result in unreliable forensic results, making it imperative that labs implement rigorous cleaning protocols, use sterile workspaces, and adhere to strict sterilization practices.

B. Improper Handling and Storage of Samples: Proper handling and storage of samples are vital to preserving the integrity of DNA evidence in the lab. Errors during these processes can lead to contamination or degradation, rendering the evidence unusable. Research highlights the importance of following strict protocols for sample handling and storage, including the use of sterile containers and controlled environments.

2. Technical Errors

- A. Mislabelling and Misidentification of Samples:** Mislabeling or misidentification of samples in the lab can lead to incorrect results, potentially compromising the evidence.
- B. Inaccurate DNA Extraction and Analysis Techniques:** Errors in DNA extraction and analysis can introduce contamination or produce inaccurate results, jeopardizing investigations. The use of validated and standardized protocols is essential for ensuring accurate and reliable DNA analysis. Regular proficiency testing for lab personnel, alongside adherence to international forensic standards, can improve the consistency of results.

Historical Cases of DNA Contamination (Real-World Example)

- Numerous high-profile cases have demonstrated the severe consequences of DNA contamination, emphasizing the importance of stringent forensic protocols.
- One of the most well-known examples is the O.J. Simpson case, where allegations of evidence mishandling and potential contamination cast doubt on the integrity of the DNA evidence presented.
- Concerns about cross-contamination and improper storage contributed to the defense's arguments and the ultimate not-guilty verdict, highlighting the importance of proper handling of forensic evidence to avoid public mistrust and legal challenges.