

Unmasking Identities Amidst Tragedy: The Role of DNA Analysis in Air India Plane Crash Victim

Introduction

Following the tragic crash of an Air India Boeing 787 Dreamliner in Ahmedabad, authorities have turned to advanced DNA analysis to identify victims. This approach becomes critical when bodies are severely damaged and traditional identification is not possible.

Why DNA Analysis is Essential

- **Unique Identity:** Except for identical twins, every individual has a unique DNA profile.
- **Gold Standard:** Especially in mass fatality events, DNA analysis is considered the most reliable method for identifying human remains.



Collection and Preservation of DNA Samples

- **Degradation Timeline:** DNA starts degrading immediately after death, especially in warm and humid conditions.
- **Best Practices:**
 - Collect samples **as soon as possible**.
 - Store in **cold, dry environments** or freeze at **-20°C**.
 - **Soft tissues** degrade faster; hence, **bones and teeth** are preferred for collection.
- **Timeline Variations:** Sample collection varies with scale; e.g., 9/11 took 10 months.
- **Reference Samples:** DNA from **parents or children** (50% match) is collected to compare and confirm identities.

Methods of DNA Analysis

1. Short Tandem Repeat (STR) Analysis

- Evaluates repetitive sequences in **nuclear DNA**.
- Ideal when nuclear DNA is **well preserved**.
- Can establish **familial relationships** with high precision.

2. Mitochondrial DNA (mtDNA) Analysis

- Used when nuclear DNA is **degraded**.
- mtDNA is passed down **maternally**.
- Matches can be made with **mother, maternal siblings, or maternal relatives**.

3. Y Chromosome Analysis

- Focuses on **paternal lineage** through the Y chromosome.
- Useful when only **male relatives** are available (father, brothers, uncles).

4. Single Nucleotide Polymorphisms (SNPs) Analysis

- Used for **highly degraded DNA**.
- Identifies **unique genetic variations** at single points in the DNA.
- Matched with **personal items** (e.g., toothbrush), but less effective compared to STR.

Way Ahead

- **Technology Integration:** Continued improvement and deployment of forensic DNA technologies in disaster victim identification (DVI).
- **Faster Response Systems:** Establish rapid-response teams with cold storage facilities for immediate DNA preservation.
- **National DNA Database:** A central DNA database can accelerate identification in emergencies.
- **Training & Awareness:** Train local forensic teams and invest in public awareness regarding the importance of personal DNA records.

Conclusion

DNA analysis stands as a beacon of precision amidst chaos, allowing grieving families to achieve closure. While challenges remain in degraded conditions and time sensitivity, evolving forensic techniques ensure that even in the aftermath of large-scale disasters like the Air India crash, science can restore identities and dignity to the lost.