

## **DNA Identification Techniques**

## **Prelims: Current events of National Importance**

## Why in News?

After the Air India Boeing 787 Dreamliner crash in Ahmedabad, authorities are using DNA analysis to identify the remains of those killed in the accident.

- **DNA Identification** Every person <u>has a unique DNA</u> that is present in nearly every cell of their body except identical twins.
- DNA identification is the gold standard for identifying human remains, especially after mass fatality events in which bodies might not be easy to identify otherwise.
- As soon as an individual dies, their DNA begins to degrade.
- Over time, this degradation can make it difficult, even impossible, for the DNA to be analysed.
- The extent of degradation depends on the kind of tissue DNA is extracted from and the conditions in which the body is kept, among other factors.
- **Sample Collection & Storage** DNA survives much better in cold and dry conditions than in hot and humid conditions.
- So, samples must be collected as soon as possible, and once collected, stored in as cool and dry an environment as possible.
- They should ideally be *frozen at minus 20 degrees Celsius*, or, in the case of soft tissues (skin, muscles, etc.), they may be stored in 95% ethanol.
- DNA from soft tissues degrades much faster than that from hard tissues (bones and teeth).
- This is because cells in hard tissues are largely protected from the effects of putrefaction and decomposition, forensic investigators usually collect DNA from hard tissue.
- **Reference Matching** To identify who the collected DNA belongs to, reference samples are collected from biological relatives.
- Parents and children of the victim are ideal candidates for providing these samples, given that they share 50% of each other's' DNA.
- Analysis Methods After the samples are collected, the next step is to extract DNA from them.
- Subsequently, depending on the quality of the collected DNA, scientists can choose between a number of different methods of analysis.
- Short tandem repeat (STR) analysis The method evaluates short tandem repeats, which are essentially short repeating sequences of DNA.
- STRs are used for DNA identification as they widely vary between individuals.
- **Mitochondrial DNA (mtDNA) analysis** This method is used when nuclear DNA is degraded or unavailable.

- Mitochondrial DNA is found within the cell's energy-producing organelles known as mitochondria.
- As mtDNA is present in multiple copies within the cell, it is easier to recover from human remains that are not well preserved.
- Y chromosome analysis Humans have two types of sex chromosomes, X and Y biological males typically have one X and one Y chromosome, and biological females typically have two X chromosomes.
- **Single nucleotide polymorphisms (SNPs) analysis** The method is typically used when the DNA to be analysed is highly degraded.
- A SNP is a variation in the DNA sequence where a single base -A, C, G, or T at a specific location differs among people.
- Given that SNPs are unique to each person, they can be used for identification purposes with the help of reference samples taken from the victim's personal belongings such as a toothbrush and hairbrush.

## Reference

The Indian Express | How DNA identification works

