

# How does DNA identify victims in mass disasters?

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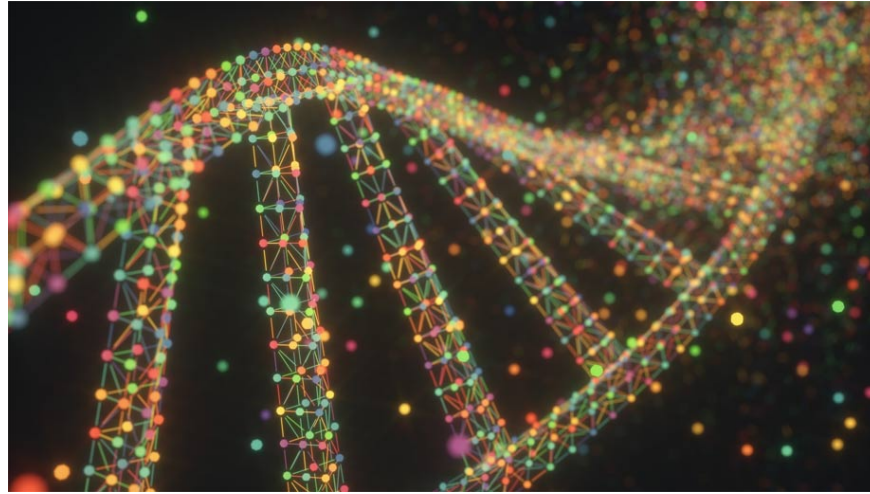
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On June 12, 2025, an Air India flight crashed shortly after takeoff, killing 260 people. The plane was carrying more than 125,000 liters of fuel, causing a massive fire. Some bodies were burned beyond recognition, dismembered, or otherwise disfigured. To identify the bodies, officials sought DNA samples from the victims' families. More than two weeks after the disaster, DNA analysis was completed and all those killed in the crash were successfully identified.

Around the world, **DNA analysis is the gold standard for identifying human remains after mass disasters** like this, whether it's a traffic accident, a major natural disaster, or a terrorist attack. But **how does DNA analysis actually work? How does DNA help identify victims in these catastrophic events involving mass fatalities?** Let's find out!

**DNA analysis involves collecting two types of samples: postmortem and antemortem.** Postmortem DNA is collected at the scene, while other experts take photographs of the victim's teeth and police collect fingerprints, then record specific characteristics, such as clothing and personal belongings, according to Kerstin Montelius, a molecular biologist at the Swedish National Council of Forensic Medicine.



" DNA samples can be taken from any tissue in the body ," Montelius told Live Science.

DNA collectors must ensure that samples are free of contamination, as the risk of remains becoming mixed up after a mass disaster is high. The environment can also affect the quality of the sample. For example, victims of the September 11 attacks on the World Trade Center were exposed to fire, high temperatures, and firefighting water. In 2004, victims of the Southeast Asian tsunami were exposed to seawater and warm, humid air.

According to a 2007 article on minimizing the risk of contamination published in the journal *Forensic Science, Medicine, and Pathology*, intact blood or soft tissue samples are generally preferred for analysis. The exception is in cases where remains are decomposed or mixed, in which case bone and tooth samples are preferred. When the impact of specific environmental factors is uncertain, it is reasonable to collect different types of tissue samples from each victim.

The next step involves preparing a DNA profile for each victim. This involves cleaning and isolating the DNA from tissue samples, determining the approximate amount of DNA present, and copying that DNA with an enzyme to obtain enough data for analysis. Finally, the DNA fragments are separated based on their size, creating a visual representation of an individual's DNA.

'The DNA profiles obtained are then compared to antemortem specimens — that is, items known to have belonged to the victim, such as a toothbrush or razor,' says Jeremy Watherston, a forensic biologist and executive director of research and innovation at Forensic Science Queensland. ' *In addition, the DNA profiles obtained are compared to specimens from known relatives — such as the victim's father or mother.* '

If done to the high standards expected, this DNA analysis method is a foolproof way to identify victims — and when combined with other types of chemical analysis, it can even be used to tell identical twins apart, said Peter Ellis, an Australian forensic pathologist who chairs a subgroup of Interpol's Disaster Victim Identification Working Group. But he told Live Science that the process also poses a few challenges.

" *Some of its disadvantages include the technological equipment required to perform it, and the need for good, uncomposted postmortem samples . Completely cremated remains may not contain enough DNA for identification .* "



Although DNA analysis is an important scientific tool for identifying victims of mass disasters, the process involves many ethical issues, such as assumptions about the location and method of identification, how bodies are disposed of after death, and how disasters are handled.

Caroline Bennett, associate professor of social anthropology and international development at the University of Sussex in the UK, wrote an article about how DNA analysis can clash with social, political, and cultural norms. She cited the example of Iraq in 2005, when ' *the government was adamant about preserving the integrity of the bodies* ' of those who went missing under Saddam Hussein's Ba'ath regime. The Iraqi government also required that bones collected for DNA analysis be returned for burial with the bodies.

*" It is important to consider such questions before beginning any procedure to ensure that the handling of the deceased is done respectfully and carefully ,"* Bennett told Live Science.

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