

How Forensic DNA Analysis Helps Solve Cold Cases

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Your Monthly Insight into the Power of DNA Science

Welcome to This Month's DNAnews

For more than 21 years, ITSI Biosciences has delivered trusted bioanalytical services and innovative products that support life science research and development. Through DNAnews, we share accurate, and engaging updates on how DNA science is shaping the world around us.

Cold cases are those unsolved investigations that remain open for years or decades. They represent some of law enforcement's biggest challenges. But advances in DNA technology are giving investigators powerful tools to solve them. Below, we break down how today's DNA technologies bring answers, closure, and justice to cold cases.

1. Modern DNA Profiling: Turning Old Evidence into New Leads

Short tandem repeat (STR) analysis remains the cornerstone of forensic DNA work. New, highly sensitive technologies can now generate DNA profiles from older or previously unusable samples. This matters because archived evidence can be retested with improved methods, tiny samples may produce usable profiles, and the more profiles produced the more matches may be possible in a national DNA databases. A 1995 assault was solved nearly 30 years later when updated extraction tools produced a full DNA profile from a tiny sample thought unusable at the time.

2. Touch DNA: Solving Cases with Microscopic Clues

"Touch DNA" refers to genetic material left behind from skin cells when a person touches an object. Modern methods can recover DNA from door handles, clothing, weapons, tape or bindings and personal items. For example, touch DNA recovered from duct tape helped solve a 20-year-old kidnapping case when it matched an individual arrested years later.

3. Forensic Investigative Genetic Genealogy: A New Era in Investigation

One of the most transformative developments in the last decade is forensic investigative genetic genealogy (FIGG). This approach uses public genealogy databases, where individuals voluntarily upload their DNA, to identify potential relatives of an unknown suspect. Below is how it works

- a) Investigators generate a DNA profile from crime-scene evidence.
- b) The profile is compared against public or law-enforcement-accessible genealogy databases.
- c) Even distant genetic cousins (as far as 4th–5th degree) can provide enough clues to build a family tree.
- d) Investigators combine genealogy, historical records, and traditional detective work to narrow down suspects.

A series of cold-case assaults from the early 1990s were linked to the same unknown perpetrator. Genealogy analysis identified a cluster of distant relatives in a small region. Building out the trees allowed investigators to identify one family line, leading to a suspect who had since moved across the country. A confirmed DNA match closed the case after 30+ years.

4. Advanced Extraction Technologies: Recovering DNA Others Can't

Modern extraction kits and workflows, such as advanced lysis buffers, inhibitor removal strategies, and micro-volume purification systems enable analysts to recover DNA from highly degraded samples such as,

- a) Environmentally exposed evidence
- b) Old, archived materials preserved under suboptimal conditions

Environments that once destroyed DNA (heat, moisture, oxidation) no longer prevent analysis. This has opened the door for countless re-examinations.

New chemistries and purification methods can retrieve DNA from severely degraded, contaminated, or minimal samples, including from decades-old evidence. A 1978 homicide case was reopened after new techniques recovered partial DNA from long-archived, soil-contaminated clothing.

5. mtDNA & Y-STR Testing: When Nuclear DNA Falls Short

Alternative testing helps when traditional nuclear DNA is limited.

mtDNA: Tracks maternal lineage; ideal for bones, teeth, and old hairs.

Y-STRs: Tracks paternal lineage; useful in male-specific cases.

Example:

Remains from a cold case were identified using mitochondrial DNA matched to a maternal cousin, thereby solving a missing-person case after 30+ years.

6. Growing DNA Databases = More Matches

Each year, forensic and genealogical databases grow. With more DNA profiles available:

- a) Old evidence can match newly added individuals
- b) Unrelated crimes can be linked
- c) Genealogy searches become more powerful
- d) Cold cases gain new life

Example:

A 2022 burglary sample matched DNA from a 1994 homicide, providing an unexpected lead and reopening the investigation.

Modern DNA analysis can:

- a) Deliver answers to families
- b) Identify long-unknown perpetrators
- c) Exonerate the innocent
- d) Renew hope for justice

Cold cases that once seemed unsolvable are being cracked open thanks to advances in DNA science.

With more than two decades of expertise, ITSI Biosciences can support laboratories and investigators with:

- Sample-prep solutions
- Trusted bioanalytical services
- Tools that bring clarity to challenging samples

About ITSI Biosciences

ITSI Biosciences is a leading life science company with over 21 years of experience providing bioanalytical services and innovative products to support life science research and development. Through our monthly DNAnews newsletter, we aim to educate, inform, and inspire our readers with the latest insights into how DNA is shaping our world.

To learn more about ITSI Biosciences or to request DNA testing services, visit:

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