

DNA profiling

Genes make up the blueprint for our bodies, governing factors such as growth, development and functioning. Almost every cell in the human body contains a copy of the blueprint, stored inside a special sac called the nucleus. The estimated 23,000 genes are beaded along tightly bundled strands of a chemical substance called deoxyribonucleic acid (DNA). These strands are known as chromosomes. Humans have 46 paired chromosomes (half inherited from each parent), with two sex chromosomes that decide gender and 44 chromosomes that dictate other factors. Certain portions of DNA are unique to each individual. DNA profiling is a way of establishing identity and is used in a variety of ways, such as finding out whether twins are fraternal or identical. DNA samples are usually obtained from blood.

Uses of DNA profiling

Some of the uses of DNA profiling include:

- **Paternity** - to find out if the alleged father is actually the biological father of the child.
- **Twins** - identical twins share the same genetic material, while fraternal (non identical) twins develop from two eggs fertilised by two sperm and are no more alike than individual siblings born at different times. It can be difficult to tell at birth whether twins are identical or fraternal.
- **Siblings** - for example, adopted people may want to have DNA tests to make sure that alleged biological siblings are actually their blood brothers or sisters.
- **Immigration** - some visa applications may depend on proof of relatedness.
- **Criminal justice** - DNA testing can help solve crimes by comparing the DNA profiles of suspects to offender samples. Victorian law allows the collection of blood and saliva samples from convicted criminals and suspects. DNA profiles are then kept on a database.

DNA profile explained

While DNA contains material common to all humans, some portions are unique to each individual. These portions, or regions, contain two genetic types (alleles) that are inherited from the person's mother and father. A person's DNA profile is made by investigating a number of these regions. In a paternity test, for example, the mother's DNA profile is compared with the child's to find which half was passed on by the mother. The other half of the child's DNA is then compared with the alleged father's DNA profile. If they don't match, the 'father' is excluded, which means he isn't the father of that child. If the DNA profiles match, the 'father' is not excluded - which means there is a high probability (more than 99 per cent) that he is the father. DNA tests such as this can't offer 100 per cent proof.

Advantages of DNA profiling

Some of the advantages of DNA profiling include:

- DNA tests can be applied to any human sample that contains cells with nuclei, such as saliva, semen, urine and hair.
- DNA tests are extremely sensitive, and can be conducted using samples that would be too small for other serological tests.
- DNA is hardy, and resists degeneration even after contamination with chemicals or bacteria.
- The ability of DNA profiling to exclude a suspect means the police are able to confidently drop that line of enquiry and continue their investigation down other avenues.

Limitations of DNA profiling

Contrary to public belief, DNA profiling isn't infallible. Critics point out various problems and limitations, including:

- New DNA profiling technologies can give incorrect results, due to errors such as cross-contamination of samples.
- Older DNA profiling technologies are more prone to errors, which could give false-negative or false-positive results.
- DNA profiles can only offer statistical probability (for example, one in a million), rather than absolute certainty.
- The more people tested, the lower the statistical probability. For example, the probability of one in a million may nosedive to one in 10,000 if enough people are profiled for a single test.
- DNA databases stored on computer are vulnerable to exploitation via hackers.
- Some critics point out that holding a person's DNA profile on record is, in a sense, a violation of that person's DNA 'ownership'.
- DNA evidence is easily planted at a crime scene.

Where to get help

- Your doctor
- Genetic Health Services Victoria - Royal Children's Hospital Tel. (03) 8341 6201
- Genetic Health Services Victoria - Genetic Clinical Coordinator, Royal Women's Hospital Tel. (03) 8345 2000
- Genetic Health Services Victoria - Monash Medical Centre Tel. (03) 9594 2026
- The Murdoch Childrens Research Institute (MCRI) Tel. (03) 8341 6200
- Victorian Institute of Forensic Medicine Tel. (03) 9684 4444
- Paternity testing - Molecular Biology Section, Victorian Institute of Forensic Medicine, Tel. (03) 9684 4337, 1800 136 852
- Paternity testing - Genetic Technologies Corporation, Tel. (03) 9415 7688

Things to remember

- While DNA contains material common to all humans, some portions are unique to each individual.
- DNA profiling is a way of establishing identity.
- It is used in a variety of ways, such as establishing proof of paternity or finding out whether twins are fraternal or identical.
- Critics point out that DNA profiles are vulnerable to contamination errors, and invasion of privacy.

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