



Missing links

DNA is a vital tool in many criminal & civil trials. But how much do lawyers really understand about its workings? Andrei Semikhodskii explains

Since the development of DNA testing 20 years ago, the use of DNA for human identity and relationship testing has emerged as a powerful tool in both the civil and criminal justice systems. DNA testing can reveal whether two or more individuals are related, as well as determining the nature of their relationship. Today, it's possible to identify people by a single hair, as well as obtain information about their gender and ethnic background. Within the next couple of years, it will also be possible to ascertain their age.

Before the advent of DNA testing, human identity testing was largely carried out through blood typing. DNA analysis has superseded blood testing and is the most accurate method currently available for human identification.

The possibility that DNA could be used for human identity and relationship testing was discussed from the time that DNA was first revealed as the molecule that makes people unique.

However, it was not until the development of DNA fingerprinting by Professor Alec Jeffreys (now Sir Alec) of Leicester University, in 1984, that the first practical testing system became available.

As with conventional fingerprinting, where the various loops and whorls of two fingerprints are compared, DNA testing relies on comparing certain features called 'DNA markers' between two individuals. If DNA patterns between the samples are identical, then they are likely to come from the same person. If the profiles are not identical but major similarities are visible,

then the samples most probably come from related individuals. The degree of the similarity between DNA profiles is a representation of the degree of relation between people.

Currently, DNA testing is routinely used for both criminal and non-criminal applications. However, there is a major difference between DNA testing for civil and for criminal cases. For civil cases, DNA testing is predominantly used to determine the relationship between individuals, while for criminal cases, for example, a crime scene stain may be matched with a suspect.

In non-criminal legal practice, DNA testing is used primarily for immigration and child support cases. In 2004, more than 7,000 DNA tests were conducted for these purposes in the UK. Where no reliable documentary evidence is available, DNA testing can assist in determining varying degrees of relation between the individuals concerned, as well as an individual's ethnic background.

The first time DNA testing was used for identity purposes was in a landmark immigration case, *Sarbah v Home Office* 1985. In this case, DNA testing was used to prove the mother-son relationship between Christiana Sarbah and her son Andrew.

Now the Home Office accepts DNA testing as virtually unquestionable proof, as the results will normally (although not invariably) provide conclusive evidence as to whether the individ-

uals in question are related as alleged. The Child Support Agency uses DNA testing extensively for establishing a child's biological parents, for the purposes of providing child maintenance and support.

Adoption is another area where DNA testing is widely applied. Currently, UK adoption agencies prefer to place children into families that match their ethnic background. However, it is sometimes difficult to determine a child's ethnic background, which is where DNA testing can help.

People of different races and ethnic groups have common facial and other features that are typical of a particular race or group. The same applies to their genetic characteristics. Different racial and ethnic groups have genetic markers specific to these groups. When analysing these markers, it is possible to tell the proportion of an individual's ancestors who came from specific ethnic groups. For example, the results of ethnicity DNA testing can show that an individual has 20% of markers specific to northern Europe, 50% to the Middle East, 10% to the Mediterranean and 20% to sub-Saharan Africa. Using this information, adoption agencies can select the family with the most similar ethnic background to the child.

The criminal justice system now heavily relies on DNA-based evidence. Since it was first used in 1986 during the Enderby murder case, thousands of perpetrators have been convicted of various crimes with the help of DNA evidence and hundreds of wrongfully convicted people have been exonerated.

DNA testing has three major applications for forensic studies:

- identification of missing persons
- identification of victims of wars, accidents and natural disasters
- crime investigation.

More than 20,000 forensic DNA tests are performed in the UK every year. Out of all the criminal cases in which DNA is used as evidence, two out of three involve sexual assault. The rest are cases dealing with burglary, murder and other types of violent crime.

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In the past 15 years, DNA analysis has become an indispensable police tool in fighting crime, as it allows both unambiguous identification of the criminal by traces of biological material left at the crime scene and acquits innocent suspects

based on DNA evidence. The most common samples collected at the crime scene are blood, semen and saliva, although virtually any biological material or objects handled by a perpetrator

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can now be used for forensic DNA testing. Clothing, furniture and other items which may have traces of DNA are now routinely used for obtaining DNA evidence. The technology is so sensitive that it allows identification of a person by analysing DNA collected from a fingerprint left on the surface of an object or from a single hair left at a crime scene.

When a crime scene sample or a sample from a suspect is analysed, a DNA profile is produced. This is a digitalised representation of an individual's genotype with respect to the DNA markers tested.

In the UK, all crime scene DNA profiles, together with those of all suspects and arrestees for any recordable offence, are deposited into a National DNA Database (NDNAD), the world's first criminal DNA database. In 2004, the NDNAD held more than 2.5 million DNA profiles collected from suspects and convicted criminals (estimated to be about 40% of the UK's criminally active population), as well as more than 200,000 crime scene samples.

Police use the NDNAD as an investigative tool to help solve a wide range of crimes including murder, rape, sexual assault, robbery, terrorism, burglary and arson. They have almost doubled their clearance rate for volume crimes such as house burglary and motor vehicle offences.

As each new subject sample profile is added to the database, it is checked against all contained crime scene samples. When a

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new crime scene sample is added, it is checked against the DNA profiles of all suspected individuals, as well as against other crime scene sample records. Since its inception in 1995, the NDNAD has matched more than 200,000 crime scene samples to suspects and more than 20,000 crime scene samples to other crime scenes. Every week, more than 300 crime scene samples are matched to the suspected and convicted criminals' database.

However, it's important to note that a DNA match between a suspect and a crime scene does not automatically guarantee a conviction. DNA evidence is just another piece of evidence, although a very strong one, and on its own is often not enough to convict someone of a particular crime. DNA evidence must always be taken in conjunction with other pieces of evidence and the weight of DNA evidence is impossible to estimate without taking into account the circumstances of the case. Even when a strong match between a defendant and a crime scene sample is presented by the prosecution, non-DNA evidence may point to someone else as the real perpetrator of the crime. This 'other' evidence can decrease the weight of DNA evidence and increase the chances of a successful defence.

The development of DNA fingerprinting 20 years ago revolutionised the legal profession. Criminal and non-criminal justice systems were handed a powerful tool to solve crime and resolve civil cases. Understanding how DNA testing can be applied in the legal profession can bring benefits to both lawyers and their clients.

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