Criminalistic - The Study of Solving Crime with the use of DNA

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Since its discovery, DNA or Deoxyribonucleic Acid has found a number of applications in medicine. Owing to its uniqueness, it has been increasingly used in criminal investigation and forensics since the last few decades. In medicine, it is primarily used to determine paternity whereas in criminal justice, it serves as a useful tool to identify suspects in investigations. Although, DNA identification is not foolproof, yet its benefits in the exclusion or identification of perpetrators, especially in unsolved cases, is undeniable. In the paper, the application of DNA to criminalistics will be explored further to observe how it transformed the way evidence is pursued.

Today, DNA technology is used in convicting perpetrators in a wide variety of cases, which can range anywhere from burglary to homicide and rape. Moreover, it has proven useful in obtaining a number of post-conviction exonerations. Statistics from the National Registry of Exonerations (NRE) reveal that nearly 139 exonerations were obtained in 2017 alone through DNA analysis which totals to 2, 161 exonerations obtained between 1989 and 2017 in the U.S (Innocence Staff, 2018). The statistics clearly point to the benefits DNA technology has brought, something not possible before the technology was introduced. Earlier forensic methods such as hair comparison, serology, and blood grouping lacked the discriminatory power and statistical accuracy that was needed to yield useful leads, in conjunction with traditional investigative techniques. Consequently, it led to a number of pending unsolved cases commonly known as ‘cold cases’.

DNA testing bases its findings on a comparison of two sets of DNA sequences. Forensic experts obtain DNA samples from the crime scene and compare it with samples obtained from suspects. Testing techniques vary based on available resources and sample type but usually involve isolating a small strand of the sequence. The fragments are then sorted by means of gel electrophoresis based on their respective sizes. A blot of the gel is then taken and released onto another sample which can bind itself to the sample's sequence if the sequence in the blot matches with it. Some of the common techniques include Polymerase Chain Reaction (PCR), Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AmpFLP), and Short Tandem Repeats (STR) (Weedn, Rogers, and Henry).

The first case of DNA analysis used in criminal investigations was the one performed by Professor Alec Jefferys in 1986. Two murder and rape cases were resolved by means of DNA fingerprinting techniques after Jeffreys was approached by the local police service to aid them with investigating the murder of two girls. Jefferys obtained samples from the girls and matched them to the samples obtained from the suspects, finding them to be identical and thus identifying the culprit based on the match (Parker & Vronsky, 2015). Moreover, the analysis also acquitted a mentally challenged individual who had confessed to the murder. The DNA profile of the individual did not match with that of the culprit identified earlier. It took the local police obtaining close to 5000 samples living within the community to trace out the suspect eventually finding a match with the profile created by Jeffreys in the murder cases. The DNA match provided further credibility to the investigations against Colin Pitchfork, the perpetrator, and helped exonerate the innocent individual initially thought to be the suspect (Parker & Vronsky, 2015).

Although the analysis provided by Professor Jeffrey's was reproducible as well as accurate, it still required a large number of high-quality samples that are not always possible for investigators to recover from a suspect or crime scene. However, with later advancements and breakthroughs, newer techniques for DNA analysis were developed that included fingerprinting, profiling, typing, identity testing, and genotyping to make use of some of the rare features or characteristics of the individual’s genetic makeup. Since each individual has a unique physical appearance based on their characteristic phenotypes and unique genetic composition. An exception occurs in the case of identical twins that hold phenotypes that are hardly dissimilar. Whether the DNA is extracted from white blood cells, hair bulbs or semen, the DNA sequence remains identical (Norrgard, 2008). This uniqueness throughout the body’s tissues and organs provides the basis for DNA profiling, and thus whatever trace of the perpetrator is recovered by investigators can be used for DNA analysis. Thus DNA based criminalistics serve as a highly useful investigative tool.

The unique properties of DNA testing help investigators resolve difficult cases that would otherwise be very difficult to resolve through traditional investigative techniques. In cases, where there are no forthcoming witnesses, DNA testing can significantly reduce wrongful arrests. It explains why today DNA testing is used to solve cases ranging from sexual assaults, homicide, gang crimes, forced entry, and murders. According to the U.S. National Institute of Justice, DNA evidence was particularly found to be highly reliable in nearly 55% of the cases wherein direct biological evidence was used to create the suspects' DNA profiles. Incorporating profiles into the database, led investigators to find a lead for nearly 41% of the cases (Peterson, Sommers, Baskin, & Johnson, 2010). Furthermore, the success rates of DNA testing in criminal investigations is more than twice of traditional forensic and investigative methods, with the prosecution and arrest rates nearly twice than that obtained from traditional investigations. For prosecutors and law enforcement, DNA technology has proven to be a double-edged sword that has helped them put thousands of identified killers and rapists behind prison, but which has also revealed serious and significant flaws in traditional forensic methods and investigative approaches, such as hair follicle identification and bite-marks. In addition, it also exposed corruption and weaknesses in the way crimes were traditionally investigated by law enforcement and sentenced by jurors.

It is no surprise that the demand for DNA testing in criminal investigations has significantly gone up as awareness regarding its usefulness and potential in resolving cases has grown. The increased demand for DNA samples today is based on two key reasons; the increased need for DNA evidence to resolve criminal cases and enhanced efforts to create DNA profiles of arrested persons and convicted felons. This explains why backlogs are increasing in laboratories offering DNA services since their ability to accurately process samples does not match the rising demand for these services, while their overall capacity also does not expand in proportion with the overall demand. Furthermore, with more innovative techniques emerging that help predict specific characteristics of the suspect, such as their hair color, the demand for DNA services will only continue to increase since any trace of the suspect’s sperm, blood or saliva can be used to identify specific characteristics and features of perpetrators that remain at large (Girard, 2011).

An example of how DNA evidence helped resolve a cold case is that of Linda Strait. Linda was a 15-year old girl who was abducted on 26th September 1982, near her home as she walked towards a grocery store in Spokane, Wash. Linda was killed the next day and her body was found floating in the Spokane River. Investigations revealed that the teenager was strangled after being raped. However, nearly two decades passed with the investigators unable to resolve the case. As the conviction became difficult to prove, the case was left in cold despite narrowing down a suspect. In 1982, they lacked the technology that could use DNA evidence obtained from the suspect to unequivocally prove that he had perpetrated the crime. Arbie Dean Williams was the prime suspect of the case who was imprisoned after having been found guilty for attempted murder, kidnapping, and sexual assault of two other 8-year old girls. These crimes were perpetrated only a few months earlier than Linda Strait's murder. Yet despite suspicion, there was no way to prove that Williams was responsible in this case as well. In April 2003, as DNA technology advanced, Linda Strait's case was again re-opened to try to find leads. Williams DNA sample was obtained to match them with the samples obtained from Linda's body. Initially, there were not enough genetic markers yielded from the analysis to lead to a conviction. A year later, the case was referred by Spokane County's Sheriff to the NCMEC Cold Case Review Unit which who hired Bode Technology group, a company that specialized in DNA criminalistics. Analysis by Bode yielded a successful match between the mitochondrial DNA profile obtained from William’s blood sample to that of Linda. Although Williams was 61 years old by then, he was formally charged in 2004 for sexual assault and murder of Linda Strait, 22 years later by means of DNA testing (Govtech, 2004).

To conclude, the application of DNA to criminalistics changed the way evidence for crime is pursued. There have been significant advances in DNA testing which now serves as a powerful criminal justice tool. Owing to its efficacy in tracing and identifying criminals, especially in crimes where biological evidence is recovered, and ability to exonerate and clear suspects mistakenly implicated, there has been an incredible rise in demand for service. Today, the technology is seen as vital in ensuring fairness and accuracy within the criminal justice system, and although it is not foolproof, yet continued advanced in methodologies are yielding even more accurate results that are leading to further exonerations and resolution of cold cases.

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