Research Paper

DNA Technology in Solving Crimes

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Over the past decades, technology has changed the way we live, work, and even the way that we we solve crimes. One of the biggest game changers in the criminal justice system has been DNA technology. DNA technology has made it simpler and easier to help solve crimes. What started out as a tool to aid medical research is now being used to help solve crimes, catch suspects, and even prove that someone is innocent or guilty. It's slowly started to become one of the most reliable ways to figure out what happened during a crime and who was actually involved within the crime as well. In this paper, I'm going to talk about how DNA technology works, how it helps solve crimes. Additionally, I will be talking about some of the problems and questions it brings up.

DNA in short stands for deoxyribonucleic acid, and it's basically what makes each person unique. Except for identical twins, no two people have the exact same DNA. That's what makes it such a powerful and key tool in investigations. When someone leaves behind blood, saliva, skin cells, or hair at a crime scene, investigators can collect that and test it for DNA. Then, they can compare that DNA to other samples, either from suspects or from national databases.

The process scientists use includes something called polymerase chain reaction, which helps make more copies of the DNA so there's enough to test and multiple times if needed. Then they look at specific parts of the DNA that tend to be different in every person. This helps them build what's called a DNA profile. If they find a match, it can link a person to the crime, this would make them able to solve the crime and get closer to the answer. If they don't find a match, it might help rule someone out and still help them.

DNA has a huge impact on helping solve crimes. These days, DNA is used in all kinds of criminal investigations, everything from robberies to murders. It's especially helpful when

there aren’t many clues to go on. Let’s say investigators find a drop of blood or a hair at the scene of a crime. They can test it, and if it matches someone already in a national DNA database like CODIS (the Combined DNA Index System), they might have a lead. CODIS has been a huge help throughout the years and it makes solving crimes a lot less time consuming.

CODIS is a big system that stores DNA profiles from people who have been arrested or convicted, and also from crime scenes. So if there’s a match, police might be able to identify a suspect really quickly. In cases where there isn’t a direct match, investigators can use what’s called familial DNA. That means they look for someone who has a similar DNA profile; like a close relative or family member. This has helped solve some major cases, including the famous Golden State Killer case where police used a genealogy website to track down the suspect through his relatives. If this was not a part of technology at the time they might have never discovered who he was. On the other hand , DNA can also help clear people who are wrongly accused and prevent them from being imprisoned for no reason. Just because someone was at the scene doesn’t mean they did the crime, and DNA can help sort that out and very effectively.

One of the best things about DNA is how it helps solve cold cases, these are so many crimes that happened years ago but were never solved because technology wasn't as advanced. Sometimes there also wasn’t enough evidence back then. If investigators saved biological evidence, they can now go back and test it using new methods. Finally, being able to solve the crimes that took place in the past. There are a lot of examples of this. One that really stands out is the case of Kirk Bloodsworth. He was convicted because it was alleged that he committed murder, as well as, sentenced to death in the 1980s. Years later, DNA tests proved he was completely innocent. He became the first person on death row in the United States to be cleared by DNA evidence. His case made people start thinking more about how important it is to use

science in court. Instead of just putting an innocent man up for death and killing him. There's also an organization called the Innocence Project that uses DNA to help free people who were wrongly convicted. They have helped free hundreds of people out of prison. These are people who spent years, sometimes even decades, behind bars for something they didn't do.

DNA national databases such as CODIS have made a huge difference in solving crimes. These systems let law enforcement across the country share DNA information. So if a crime is committed in one state, but the suspect's DNA is in the system because of a crime in another state, the police can still make the connection and track down that individual. The more profiles these databases have, the more useful they become. The more criminals and suspects checked in, the more names are in the database. Some people feel uncomfortable with the idea that their DNA might be stored by the government; especially if they were just arrested and not convicted of anything. There are also concerns about mistakes or people being unfairly targeted. Most agree that when used properly, DNA databases are incredibly helpful for solving crimes faster in addition to more accurately.

DNA is very helpful, but it's not always perfect. One issue is contamination when revolving DNA. If a crime scene isn't handled with the proper care, DNA from investigators or other people can get mixed in. This can lead to confusion or false leads, which leads to time wasted. Another problem that can occur when a scene isn't secured is called secondary transfer. When someone touches something, and then someone else touches it, and DNA from the first person ends up in a place they never actually were. This can be very confusing and mislead law enforcement. Sometimes, crime scenes have DNA from more than one person, which makes it harder to figure out whose belongs to whose. Forensic experts have to interpret the results, and that can get complicated. If the people in court such as the hudge or jurors; don't fully

understand how DNA works, they might make the wrong decision and get misinterpreted. Finally, the last issue is the accumulation of untested evidence. In various places, there are still tons of rape kits and other samples waiting to be tested. This slows down justice and keeps victims waiting for answers. It's unethical to neglect piled up work, a solution could be to hire more employers or use technology to solve this issue.

When involving technology into the criminal justice system as we have seen there can be various issues. Individuals have also started to discover ethical issues with DNA use in crime investigations. As DNA technology becomes more common, people are starting to ask questions about privacy. Who should be allowed to collect your DNA? What happens to it after it's been tested? Is it fair to use someone's family's DNA to investigate them? Is it okay for the government to hold onto your genetic information even if you weren't convicted of a crime?

Websites like 23andMe and GEDmatch let people explore their family history. Sometimes, law enforcement uses these websites to find suspects. They usually do this without asking for permission from the family or the individual themself. Some sites now require users to opt in if they want their DNA to be available for police, but a disclaimer is that not all websites do this. I believe that this should be looked into more and the criminal justice system should definitely make more laws and rules regarding this. Another really significant issue that revolves around DNA technology is racial bias. In a lot of communities; especially Black neighborhoods that are already heavily policed, people are more likely to be stopped, arrested, and have their DNA collected, for the most minor offenses. Over time, these communities end up being overrepresented in national DNA databases like CODIS. That means if a crime happens and there's DNA evidence left behind, there's a much higher chance it will match someone from one of these over-policed areas, just because their information is already in the system. This puts a

target on them from the start and creates a higher chance of them being arrested even if they didn't commit a crime. This also makes the technology have a bias which is unfair and unethical.

DNA technology is still in the process of evolving. One of the most recent things invented is called rapid DNA testing. It can give results in just a few hours instead of days or weeks. This could help solve crimes a lot faster and could be really helpful, even potentially saving a life. There's also research going on about something called epigenetics, which looks at how a person's environment affects their DNA. In the future, this might help investigators figure out even more about a suspect, such as: their age or lifestyle. Also, with artificial intelligence showing up in more aspects of our lives, it's now being used to help analyze DNA in criminal cases, too. These new tools can go through tons of DNA data way faster than a person could, which can save a lot of time. AI technology can even potentially solve it more accurately than humans. In some cases, they can even find connections between crimes that people might miss, such as: similar patterns in the DNA or links between suspects that weren't obvious before. It's kind of amazing how this technology can help solve cases that might have stayed cold cases for years. Even though AI can be super helpful, it's not perfect and we need to be extremely careful and cautious when using it. It's still made by humans, and sometimes it can pick up on the same biases that already exist in the system. For example, if the data it's trained on isn't diverse or balanced, it might not treat every case equally. There's also the risk that people will trust it too much just because it's a computer, when really, it can make mistakes too. People can end up trusting it too much as well as relying on it, which can end up creating even more issues. That's why it's important to make sure AI is being used in a responsible way. We need rules for how it's used, people who understand how it works, and checks in place to make sure it's not doing more harm than good. When used the right way, AI can definitely help make DNA investigations

faster and more accurate; but its important to remember that we have to be cautious about how we use it.

DNA technology has honestly changed the game in the world of criminal justice in a huge way. It's used to help solve crimes, track down suspects, and even prove that some people who were convicted didn't actually do it. It's one of the most powerful tools that law enforcement has at their ability right now. There are still some challenges that come with it; things that involve contamination of evidence, concerns about people's privacy, and how the technology might not always be used equally in every case. It's important that we make sure it's being used in a smart and responsible way. When it's used the right way, DNA can totally help us build a justice system that's more accurate, more fair, and honestly just more trustworthy overall.

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