Reading the Fine Print: Forensic Evidence in Jewish Courts

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In the late 20th century, a rapist turned murderer terrorized Southern California. People were scared to leave their homes in fear they might be his next victim. The criminal was smart in the way that he carried out his crimes, staying informed of any media coverage and the overall progression of his case. He seemingly flaunted his power over the petrified citizens, as if he believed he would always be able to evade accountability. The police even suspected that he was a member of the law enforcement, but years went by and the case remained unsolved. When DNA evidence first surfaced, the police were able to ascertain that this perpetrator was the same murderer that was loose in Northern California. And, yet, they were still not able to identify him and completely solve the case. Only recently, through genealogical data from a family tree that his distant relative initiated, were the police able to identify the murderer as Joseph James DeAngelo and he was put on trial. They traced his DNA through the family pedigree tree and matched it to the DNA left at the crime scenes years ago [1].

As this case demonstrated, scientific evidence, such as DNA identification, has revolutionized the entire judicial system. When incriminating forensic information is presented, police are more likely to clear cases, lawyers are less likely to enter into plea bargains, and sentences are more severe [2]. This evidence is especially helpful in cases where the possibility of solution is otherwise minimal, for instance, if suspects are not identified immediately following a crime. In fact, police generally spend a considerable amount of time tracking down eyewitness testimony, and their hard work does not always lead to helpful evidence. James K. Stewart, a previous director of the National Institute of Justice, wrote:

> Some cases… cannot be proven without forensic testimony. Others cannot be solved without it, and even those cases where a suspect is quickly arrested are more likely to be solved when eyewitness testimony or confessions are supported by forensic findings [2].

Forensic technologies can identify a body, determine a cause of death, identify a suspect, prove or disprove a rape allegation, and provide information about gunfire, such as the gun that the bullet was shot from and the position in which the gunman was standing [3]. Because 'physical evidence is preferred over human testimony' [4], there has been a shift towards physical evidence in order to alleviate errors caused by witness testimony. This movement was further emphasized by the establishment of the Institute for Forensic Evidence.

DNA evidence is a powerful form of identification because the likelihood that two people match the same sample is minimal. Scientists look specifically at thirteen or more loci on the DNA strands where the human code is known to be diverse. These areas contain short-tandem repeats of genetic information, with the number of repeats varying between people. Because each person receives one chromosome from each parent, he has two numbers of repeats for that chromosome pair [5]. The likelihood of the pair of numbers matching at all the sites to another person is slim, and, therefore, this technology can be relied upon to accurately identify and prove involvement in illicit activities.

Because of the reliability of forensic evidence, it was incorporated into the judicial system. The Innocence Project, led by Dr. Barry Scheck, an American lawyer, utilized DNA evidence to exonerate those that were wrongfully incarcerated based on faulty eyewitness testimony and misidentification. This determination to incorporate forensic evidence into a verdict highlights the fact that DNA evidence is a crucial piece of evidence that must be considered when determining one's guilt or innocence [6].

Accordingly, scientific evidence is accepted, and even preferred, in secular court, but is it permissible to be used in a *beit din,* a religious court?

The Torah formulated specific guidelines to define that which is considered to be incriminating testimony, stating that the testimony of two witnesses is established as fact in the eyes of Jewish law (*halacha*). This legal criterion is dependent on the *pasuk*, "*Al pi shenayim eidim yakum davar,*" based on the word of two witnesses would a judgment be made

(Deuteronomy 19:15). There are cases, however, where two reliable witnesses are not present. In such situations, is the court not allowed to act? This cannot be true, as the court's jurisdiction would thus be limited to a select number of cases. This would diminish its authority and ultimately leave solvable cases without any arbiter; justice would not be properly served. Therefore, the courts must be permitted, if not obligated, to examine not only circumstantial evidence or non-legal witnesses who are undoubtedly telling the truth, but also evidence available through scientific discoveries and modern technology [7]. In certain situations, leniencies may be made to incorporate non-legal testimony in efforts to maintain the power of the judicial system. Perhaps these strict definitions of that which the court considers valid testimony is only applicable in a case of capital punishment, whereas in other types of cases, a judge would be permitted to incorporate alternative forms of evidence.

The rabbis of the Talmud (*Kiddushin* 73a) describe a situation in which three women give birth at the same time in the same place. Each is part of a different class of the Jewish society - *kohen* (a priest), Levite, and *mamzer* (an illegitimate child) - the latter of which has significant *halachic* ramifications, making the identification of the children crucial**.** The only person that had the ability to discern between the infants was a non-Jewish midwife, who, according to the strict definition above, would not qualify as a legal witness. In this situation, the *beit din* ruled that she can be believed, and, therefore, function as a witness. The Ran framed this story as the rabbinic pursuit for truth. Because the midwife was the only source to determine the facts, the rabbinical court accepted her testimony. Additionally, the Rama believed that if there are no legal witnesses available, judges should turn to reliable witnesses, regardless of whether the technical qualifications were met. He acknowledged that while there are rabbis who agreed with him, there are others, such as the Rambam, who did not (*Darchei Moshe, Choshen Mishpat* 35). Nonetheless, according to the Rama's reasoning, forensic evidence can be considered an acceptable form of testimony as it serves the same function as a "reliable witness."

A similar situation arose in an Israeli hospital under auspices of Rabbi Shlomo Zalman Auerbach. Two babies were mixed and the staff was unable to determine which baby belonged to which couple. When deciding whether DNA testing should be used to identify the correct babies, Dr. Abraham, a doctor in the hospital, consulted Rav Auerbach who ruled that it was permissible (*Nishmat Avraham* E.H. 4:6).

Rav Auerbach, a strong proponent of DNA technology, said:

> If this [DNA] test is well-known and accepted throughout the world as reliable as a result of a numerous and unambiguous tests, it is reasonable to say that the results of this testing constitutes admissible evidence by *halachic* standards [8].

Despite the potential for the results of a DNA test to be disproved in the future, Rav Auerbach believed that the current acceptance of the accuracy of a scientific procedure was sufficient to elevate it to the status of permissible evidence in a *beit din*.

Rav Auerbach's position was supported by additional prominent rabbinic figures. Rav Shlomo Dichovsky, a prominent modern judge who sits on the Israeli Rabbinate's Rabbinic Court of Appeals, noted that both the Rambam (*Moreh Nevuchim* 3:14) and the Tashbetz (1:163-165), a rabbi and practicing doctor during the middle ages in Spain, wrote that the medical assertions in the Talmud were based off of medical knowledge of the time. Therefore, conventionally accepted modern scientific evidence could be a valid factor in the *halachic* decision-making process. The Rivash disagreed with this notion, arguing that all the medical assertions in the Talmud were divinely inspired (Rivash 447).

Rav Kook supported the notion of incorporating scientific evidence in *halachic* decisions, however, he did not believe that it can be applied so simply. Rav Yosef Karo in his *Shulchan Aruch* noted that if a doctor determined that his patient can survive without eating on Yom Kippur, but the patient disagreed, then the patient was permitted to eat on Yom Kippur. On the other hand, if a doctor determined that the patient must eat on Yom Kippur in order to survive, but the patient disagreed, then the patient was still permitted to eat on Yom Kippur (*Orech Chaim* 618:1). Rav Kook used these rulings to demonstrate that scientific evidence was only relied upon to a certain degree. The Shulchan Aruch considered the important possibility that the doctor was both correct and incorrect, respectively, and, therefore, the patient was permitted to eat in both cases [16].

More specific rulings of the permissibility of DNA evidence in *halacha* can be seen when analyzing certain

cases in which the use of this evidence would be helpful. The role of DNA evidence comes into play frequently in the discussion of *agunot*. An *agunah*, literally translated as a "chained" woman, is a *halachic* status thrust upon a woman who is, for some reason, stuck in her marriage. A woman remains in this status until her husband gives her a *get*, a Jewish divorce document. If she is not given a *get*, whether because he refuses to give it to her or has gone missing, an *agunah* is still legally considered married and is prohibited from remarrying. When a woman's husband goes missing, even if he is presumed to be dead, she is "chained" to her marriage until definitive proof of his death is given. Without this proof, any relationship she engages in would be considered adultery and children born from it would be *mamzeirim*. Similarly, a man is prohibited from being married to sisters at the same time. In order to allow a man to marry his deceased wife's sister definitive proof of her death is necessary [4].

In order to verify a person's death in a *beit din,* either identification of the body or testimony about the death must be given. While the *beit din* certainly tries to be lenient in these cases, it cannot be so lenient as to allow the possibility of error; the *halachic* consequences are too significant. Therefore, there are specific standards for body identification. Unusual birthmarks or features can legitimize an identification. The Rama even formulated guidelines for that which was considered a "specific distinguishing mark." He believed that a short or long physical feature would not be enough to identify a body, but a missing or extra feature was sufficient [7]. Prior to the popularization of photography, the memory of these marks would fall into the realm of subjectivity.

The Israeli Police Rabbinate created a three-part test to determine the validity of identification - fingerprint, odontology, and DNA. Even according to stringent opinions, such as that of Rabbi Wosner, a prominent *Haredi* rabbi from Bnei Brak, an *agunah* is permitted to remarry as long as the DNA found at the scene matches that of her missing husband and a probable reason for the man's presence there is provided. More lenient opinions in the United States suggest that the DNA fingerprinting alone is sufficient evidence, as long as the testing is conducted under the provisions set by the New York City Office of Medical Examiner [9].

When the United Airlines Boeing 747 aircraft hit the World Trade Center in 2001, tragedy befell New York City. Among many problems facing the Jewish community, were the *halachic* questions that immediately arose, such as when does one start the mourning practices of sitting *shiva* and saying *kaddish*? Another major question that surfaced was regarding the status of the wives whose husbands had reportedly perished in the towers but whose bodies were not found in the rubble. Rabbi Yona Reiss, the *av beit din,* head of the court, of the Beth Din of America at the time, worked tirelessly with the Chief Medical Examiner's office and the widows to find *halachically* legitimate proof. The Medical Examiner's office worked to identify remains and issue death certificates and Rabbi Reiss consulted medical experts and civil authorities to determine whether the proof was valid to free the widows from their status as *agunot*. They managed to free all of the women, with the help of DNA analysis. However, it is important to note that the team ensured that the DNA evidence was not the sole proof of the deaths and there were multiple other factors permitting the women to remarry [6]. Whether this was because they believed that DNA evidence cannot be the sole testimony in *beit din,* or because they wanted to satisfy even the stringent opinions, is not clear.

In *agunah* cases, the *halacha* is lenient in terms of whom it considered to be legitimate witnesses. A single witness, women, and non-Jews, whose testimony ordinarily would not qualify as *halachically* valid, were accepted in order to relieve the woman of this status [9], and, likewise, so is the use of DNA evidence [16]. Rav Moshe Schreiber in his work, the *Chatam Sofer*, tried to extend these leniencies. He wanted to make civil divorce documents an extension of a *get* based on the rabbis' ruling in the Mishna in *Gittin* (10a) where they claimed that documents signed in a secular court could be accepted as evidence in a Jewish court, because a non-Jewish court was careful to preserve its integrity (*Chatam Sofer, Even HaEzer* 43). However, because this ruling was mentioned in the context of these divorce cases, there is ambiguity as to whether the forensic evidence was acceptable only because of these leniencies. The question remains as to whether DNA evidence can be employed in other types of cases in Jewish courts as well.

Forensic evidence for the purpose of victim identification is useful, not only in avoiding potential *agunah* scenarios, but also in serving other *halachic* purposes. For instance, post death, immediate burial is *halachically* required, therefore, identification of the

parts and reconstruction of the body must be done as soon as possible. DNA fingerprinting is a fast and definitive method to be used. Completed within 24 hours using phosphoglucomutase (PGM) genetic markers and DNA typing, this evidence can help identify victims after crises [10].

Israel decided to put government organizations in place that could monitor or facilitate these identifications. At first the Israeli Defense Forces (IDF) handled terrorist attacks and civilian incidents, but the rabbinate retained the supreme authority. In 1986, when a school bus with children was hit by a train, the IDF handled the identification of the victims. But three years later, the identification was delegated to the Division of Identification and Forensic Science (DIFS) or the Israel Police. Therefore, when a bus was pushed off of the Tel Aviv -Jerusalem highway, the Israel Police handled the identification. With the Israel Police in charge, a three membered board was created, consisting of a policeman, rabbi, and jurist, to oversee the identifications. As a result, civil considerations were infused into a field that had a rabbinic dominance. The police were able to handle most identifications and only submitted the more "problematic" cases to the rabbinic authorities. Since the cases that were deemed "problematic" were defined by the police, they assumed a 'quasi-judicial/rabbinic' role by determining which cases were sent to court [4].

The use of scientific evidence could prove harmful in the case of revealing a *mamzer*. While maternity is crucial to one's Jewish identity, paternity also plays an important role. A child that was born out of one of the three major illicit relationships - adultery, homosexuality, bestiality- is considered to be a *mamzer*. A *mamzer* is only able to marry another *mamzer* and cannot participate in some communal religious acts. Therefore, establishing paternity could reveal this status and shun a person from the community.

When the Beth Din of America began to use DNA evidence as an important, albeit not the sole piece of evidence for freeing *agunot*, they opened up a "proverbial Pandora's Box" [16]. Once the court was allowing DNA evidence as proof of a man's death, then the use of DNA to determine paternity should also be permissible. Popularizing the paternity test, however, would then lead to the investigation of many *mamzeirut* cases, which could be catastrophic to Jewish communities world-wide. *Halacha* relies on even remote possibilities to prevent exposing *mamzeirut* [16]. As the rabbis say in *Kiddushin* (71a), *mamzeirut* exists only when one has the knowledge; there is no obligation to reveal this status.

The Jewish sages, or *Chazal*, allude to the fact that blood tests are not a definitive marker of paternity. Rav Ben-Zion Chai Uziel, a former Sephardi chief rabbi of Israel, is the first to discuss this rule. He referred to the Talmud (*Niddah* 30a), which stated that there are three partners in the creation of a person - G -d, a mother, and a father. The rabbis of the Talmud elucidated the parts that each partner contributed, attributing the red material (*i.e.*, the blood) to the mother and the white material to the father. Regardless of the modern belief that the composition of the blood cells is influenced by both the maternal and paternal genes, *Chazal* formulated this ruling from Divine belief, and, therefore, blood is not a determining factor of paternal identification [16]. This might not exclude modern genetic testing, as long as blood is not sampled. Rav Mendel Senderovic, a contemporary rabbi who serves on the Beis Din of Milwaukee, noted the fact that *Chazal* thought that the father contributes the bones and fingernails, and, therefore, argues that a DNA sample could be taken from either of these areas to accomplish this determination [16]. Perhaps, blood samples could be used for paternity testing, provided that the white blood cells are being tested. According to the rabbis of the Talmud, the red blood cells were inherited from the mother, but the white blood cells, because of their lack of this red pigment, were inherited from the father. Therefore, the DNA from white blood cells would be permissible for determining the biological father.

The Rashash explained a passage in the Talmud (*Bava Batra* 58a) in which the rabbis opposed a blood test that would determine the legitimacy of a child. He believed that the rabbis of the Talmud did not want to expose the *mamzer* status of a person. This belief seemingly implied that blood tests would be a permissible way to determine paternity, but the rabbis refrained from doing so in order not to reveal a *mamzer*.

R' Saadia Gaon also did not think that blood tests for paternal identification was problematic. He is known to have performed a blood paternity test (*Sefer Chasidim* 232). A story is recorded of a man who was travelling with his pregnant wife and slave. When the man died, the slave presented himself as the man's son and was given the inheritance. The wife gave birth

and when the son came of age he approached R' Saadia Gaon for guidance. R' Saadia Gaon dug up the father's body and removed one of the bones. He took blood samples from both the son and the slave and placed them on the bone. When only the son's blood absorbed into the bone, R' Saadia Gaon took that as an indication of genetic similarity [15]. While this case did not include the possibility of exposing a *mamzer,* it did point to the permissibility of genetic information to aid in the identification of true paternity.

Rav Bena'ah in the Talmud (*Bava Batra* 58a) had a similar case come before him. A man with ten sons was on his deathbed when he revealed that only one of his sons was truly his. In order to determine which was the true son, Rav Benaah asked each son to hit their father's grave. The only one who did not have the audacity to hit the father's grave was revealed as the true son. The Eliyahu Rabba, a known *Acharon*, asked why Rav Benaah did not utilize the blood test developed by R' Saadia Gaon (chapter 568). The Rashash posited that Rav Benaah did not want to reveal which of the sons were *mamzeirim*, rather he wanted to single out the one that was most respectful of their father. While this test singled out the legitimate son, it did not necessarily delegitimize the status of the other sons [16].

Rav Mordechai Willig, one of the *roshei hayeshiva* of Yeshiva University, when determining whether DNA evidence should not be used in *agunah* cases because of the risk of exposing a *mamzer*, quoted the general principle, "*ein dochin nefesh mipnei nefesh*," we do not sacrifice one soul in order to save another (*Kol Tzvi* 4:12). This clarified his view that DNA evidence can, and should, be used to help *agunot*. Therefore, Rabbi Willig attempted to make various distinctions between *agunot* and *mamzeirim* so as to allow DNA evidence for the former but not the latter. He first pointed out that in general, there is no significance attached to that which is not visible to the naked eye. This could refer to microscopic insects in food, the spacing between letters of the *Sefer Torah*, blemishes on an etrog, *etc.* Accordingly, the ability to rely on DNA evidence is called into question, because the DNA molecules cannot be seen by the naked eye [16]. Because the rules of testimony are more relaxed with *agunah* cases, the microscopic DNA evidence would potentially be permissible. This is not necessarily the case with a *mamzer*.

Rabbi Willig also suggested that DNA evidence would not be problematic in the case of establishing paternity. While the test would confirm that the husband was not the father, it does not necessarily prove that the child was a *mamzer*. The child could possibly have been conceived through artificial insemination, which would not invoke *mamzer* status according to R' Yosef Dov Soloveitchik (*Nefesh HaRav* p.255) and Rav Moshe Feinstein (*Igrot Moshe E.H.* 1:10), among others. While this distinction does solve the problem and limit the exposure of *mamzerim*, it cannot be applied to every case. This approach has not been used by other *poskim,* or decisors [16].

On the other hand, Rav Ovadia Yosef, the former chief Sephardic Rabbi of Israel, argued that DNA evidence is not an accepted means of proving paternal identity. The Rabbinic Court of Appeals in Israel rejectw the ruling of a district Beit Din on a case regarding paternal identity and Rav Ovadia Yosef suspected that it was because DNA testing would also be prohibited to reveal the identity of the father. The rabbis in the Talmud did not provide any precedent for resolving issues regarding paternal identity using DNA testing as it did for other theoretical possibilities, such as transportation on a "flying camel" (*Makkot* 5a).

Similarly, Rav Wosner and Rav Karelitz, both prominent rabbis in Bnei Brak, believe that DNA evidence can be used to avoid cases of *agunot*, however, it is not acceptable evidence in the case of *mamzeirut*. These rabbis centered their position on the fact that there is precedent to use the physical features of the missing husband, such as dental records or fingerprints, to identify a body, but no such precedent exists for comparing features of a body to the missing husband's sons [16]. Therefore, this position alleviated the potential problems with the slippery slope associated with DNA evidence by ruling that it was just not acceptable evidence for a case of a *mamzer,* but it would be for an *agunah*.

While the rabbis were careful not to unnecessarily expose a *mamzer,* a case of a *safek mamzer*, or uncertain *mamzer,* was worse than of an actual *mamzer*. A *safek mamzer* is prohibited from marrying both a kosher person and a *mamzer*. A question came before Rav Eliashiv, a *Haredi* rabbi and *posek*, about whether a DNA test should be used to settle the uncertainty of a father who is skeptical of his child's relationship to him years after birth. He ruled against it, believing that in a case where the father is not sure, we are lenient and call the child kosher and do not allow for

DNA testing [11].

In 1982, there was a case brought before Rav Shlomo Dichovsky, a member of the Ashdod district of the Israeli Rabbinate Beit Din, involving a husband's accusation of adultery against his wife and denial of his genetic paternal relationship to his kids. A DNA test verified that the father of one child was not this woman's husband, but the wife vehemently argued that she never had an extramarital affair. Rav Dichovsky ruled that the child did not have a status of a *mamzer* and yet the father had no obligation to pay for child support because there was some truth to his denial. Because the DNA test was only 99.6% accurate, it was not sufficient as evidence to give someone the status of a *mamzer*. While the other two judges on the case disagreed with the decision regarding the monetary support, they agreed with the inability for DNA evidence to prove *mamzeirut* [16]. Therefore, according to Rav Shlomo Dichovsky, the problem with DNA evidence was not its inability to serve as testimony in court, but rather the inherent possibility of error that accompanies it.

As with all modern technology, error remains a possibility. The use of DNA identification can produce false positives. Whether it is because two people touched the same object, or two pieces of evidence touched each other, there is a possibility of incorrectly matching a suspect to a scene [17]. While police realize that the new identification technology that utilizes evidence collected at the scene makes their finding solutions to criminal investigations infinitely easier, they are aware of the universally acknowledged flaws with the technology. Such flaws could prove problematic. In Israel, a system was put in place between the rabbis and police in terms of victim identification using scientific evidence in order to ensure that the evidence being submitted is credible. Although the police depend upon these scientific findings, it is often the case that they rule more stringently than the rabbis because they are aware of the mistakes that can be made [4].

There have been numerous cases, where despite the use of DNA evidence, the wrong suspect was incriminated. False positives or careless analysis can create uncertainty regarding the reliability of the evidence. For example, a segment of KHOU 11, a CBS affiliate, delved into a case regarding John Sutton, a man wrongfully incarcerated on charges of rape in 1999, and the process of proving his innocence. The technician performing the test determined that Sutton's DNA matched the sample taken from the victim when it was clear that they did not match. The error was in the way that she had separated the complex mixture and reported the match. Errors such as this are unlikely, but are not uncommon, and substantiate concerns regarding the way that DNA evidence should be used in determining a verdict [17]. Similarly, when a building collapsed in Tyre during the Lebanese War, the fingerprint analysis used to identify the victims showed three mistakes [4]. Therefore, DNA evidence could prove problematic, because unreliable testimony cannot be used in court.

Rav Waldenberg, a rabbi, *posek*, and judge in Jerusalem, is wary of the problematic nature of the inaccuracy associated with DNA evidence. He notes that many medical advances are believed to be accurate, until they are disproved in the future. Because of the possibility of error, he is not inclined to accept conclusions from these technologies as evidence in court (*Tzitz Eliezer* 13:104).

However, these inaccuracies are anomalies. Rav Mendel was skeptical of Rav Waldenberg's opposition to scientific evidence. DNA evidence is based on the assumption that every person's DNA is unique, which has been previously proven. Most of the suspicions of the inaccuracy of DNA testing were disproved by 2001 [16]. Techniques have improved and the monitoring of accuracies has increased. Similarly, Rabbi Jachter, a modern Orthodox rabbi and Jewish judge, believes that Rav Shlomo Dichovsky's reasoning for the inability to use DNA evidence in court, that the tests are only 99.6% accurate, is obsolete. The current chance of error is ten billion to one [16]. Rambam also believed that despite the inevitable error of scientific research, the findings should be followed even if they are contrary to rabbinic opinion [15].

Another potential problem with DNA evidence is the presence of a rare genetic condition, chimerism. Chimerism occurs in an organism that has more than one genome, meaning it was derived from fusion of two or more zygotes. The concern is that the DNA found at the crime scene may not match the DNA known for a specific suspect, but still could be a match to the suspect if he/she was a chimera. In 2003 there was a documented case of this - Lydia Fairchild. When she was pregnant with one of her children, a paternity test determined that she was not the biological mother of her child. While the

government accused her of fraud and suggested that she was a surrogate, samples were taken of her hair, skin and cervix to determine that she was, in fact, a chimera and was the mother of that newborn child [13].

Microchimerism, a specific form of chimerism, occurs when there is a transfer of blood between the mother and the fetus or between twins, occurs at a high frequency. Although there is doubt whether the DNA testing could pick up on these extra alleles, even if they did, they would be present in all DNA testing that would be done. Blood transfusions could also present with temporary chimerism. But there would be a unique mixture of blood that would be noticeable in any test and is enough to incriminate a suspect. A complete bone marrow transplant would change the blood cells to have a different DNA type than the rest of the cells in the body. While this is problematic, it is unlikely. Additionally, if the patient receiving the transplant did not undergo chemotherapy, then there would be a unique mixture of blood cells that could be detected [13]. These cases are problematic and fundamentally question whether DNA evidence can truly be accurate.

This condition poses the questions of whether police should be wary of chimeras when they perform DNA matches for crime scenes and whether criminals incriminated with DNA evidence should be given retrials. However, they are rare and, therefore, should not be a major concern when determining its validity in court [13].

It is interesting to note a recent discovery that the Y chromosome of the Jewish priests, or *kohanim*, contain a unique marker, showing that the *kahuna*, has a genetic basis [12]. However, this cannot be used in court as evidence because only seventy percent of *kohanim* have this common marker [7]. While this genetic fingerprint cannot prove that someone is not a *kohen*, it can verify that someone is. Interestingly, there is a small tribe in Africa, in which the men also carry this genetic marker on their Y chromosome [7]. Similarly, mitochondrial DNA can be a source of determining lineage. The mitochondrial DNA is inherited solely from the mother, as only the head of the sperm cell, which contains the acrosome and nucleus, enters into the egg during fertilization. Therefore, a deep analysis of one's saliva using modern technology can possibly confirm whether one is Jewish [14]. However, this has been challenged, as recent studies have noted paternal mitochondrial DNA can be inherited as well [18].

As we move into the 21st century, with cutting-edge technology at our fingertips, ethical ramifications must be taken into consideration. While DNA information has positive uses that could transform both the secular and halachic judicial system, this technology can be used negatively. For example, is the collection of DNA to put into a large database a breach of privacy? Is having a criminal DNA database problematic? In the case of Joseph James DeAngelo, did the police take their investigation too far by using the genealogy data?

However, should we refrain from using these technologies for fear that the negative consequences overshadow the positive ones? At what point, if any, do we outweigh the benefits with the possible detriments? Dr. David Wasserman, an attorney and director at Yeshiva University's Center for Ethics, said:

> There is nothing inherently ethical or unethical in DNA typing or most other technologies. They can be used for good or bad purposes, to good or bad effect. We must guard against the abuse of genetic technologies to infringe out privacy or to debase our understanding of human beings, but we must also promote the use of these technologies to server our values. The work of the Innocence Project and the Beth Din of America are striking examples of how DNA identification has been used to further our ideals [6].

As the innovation of our generation exponentially grows, we are only at the tip of the iceberg with the scientific discoveries. These advances can lead us into the future and give us unsurmountable potential, we just need to be wary of the ethical ramifications and stay rooted in the values of the Torah.

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