

Forensic Hair Evidence in Criminal Trials: Admissibility, Reliability and the Risk of Wrongful Convictions

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Abstract

Hair forensic evidence has helped criminal investigation and law enforcement agencies over the years to identify suspects or victims and in certain cases, to exonerate suspects, but the use of such evidence in court has led to many wrongful convictions. This is particularly evident in cases using microscopic hair comparison data because the probative value attached to such forensic evidence had been inflated by the hair experts or the chemist themselves to the extent that it dilutes any probability of unreliability that could exist in relation to such evidence. The court had relied entirely on such forensic evidence as the truth without venturing into its reliability. This is because the laws in some countries, such as Malaysia, allows the court to make a presumption that such evidence is credible if the hair analysis is done by the government appointed forensic official. Therefore, it is essential that the admissibility and the probative value of such hair evidence are scrutinised by the court in each and every case, particularly the way in which these forensic experts carry out forensic tests, as the technology and technique with regard to such analysis are evolving.

Keywords: Hair, DNA, expert, forensic evidence, criminal investigation

1. INTRODUCTION

Criminals usually leave some traces behind at the crime scene. The traces left behind can take many forms such as fingerprints, striations on bullets, blood and including hair. Hair for example is considered to contain DNA (Deoxyribonucleic Acid) from biological materials (Mahajan et al, 2019). Therefore, hair collected from the crime scene, analysed and compared with known samples can provide valuable information about the presence of suspect at the crime scene (Becker & Dutelle, 2013). Besides, hair evidence also helps to identify the victim, especially in cases of violent crimes, in which the body of the victim was deliberately disfigured to avoid identification or in cases where the skeleton and remains of the victim were only found after many years had passed since the commission of the crime. Moreover, hair evidence sometimes helps to exclude a suspect from the police list of suspects that allows them to save time and resources to arrest those suspects and to narrow down the list of suspects so that the right suspect can be arrested in a short period of time. Most importantly, the use of hair evidence is also essential for evidence purposes in court where it can assist the court in determining the presence of the accused at the crime scene, or in particular, to determine the likelihood of the accused committing the crime (Giannelli & West, 2001).

Although hair forensic evidence is important in criminal cases, it is not always easy to identify the perpetrator of the crime or the victims using hair evidence since hair found at the crime scene itself may be affected by a number of factors, such as hair exposure to the natural element, the surrounding temperature of the crime scene, the number of hair strand found at the crime scene and the presence of any roots or tissues on the hair (Deedrick, 2000). These factors will affect the qualities and the evidential value of such evidence. There are a number of ways to analyse hair. For example, hair with roots or tissues attached to it will be useful since DNA samples can be taken from such roots or tissues (Deedrick, 2000). However, in cases where the hair is found without traces of DNA, it is still possible to extract mitochondrial DNA from the hair shaft. In cases where it is impossible to extract any kind of DNA samples from the hair, a microscopic hair comparison can be carried out to match the hair found at the crime scene with the accused hair (SWGMAT, 2005).

In addition, a hair analysis could reveal whether the hair has been removed by force or had fallen due to natural causes. Giannelli (2010) explained that there are several steps in distinguishing a hair from a fiber. Then the examiner will determine whether the hair is from human or animal, the part of the body from which the hair originates, racial origin, whether the hair has been dyed, whether the hair was pulled or fell out and whether the hair had been cut or crushed. This will help the investigator to determine if it was purposely planted on the scene of the crime. Hair that naturally falls off the body shows a root without any follicular tissue, while hair root with the presence of follicular tissue indicates that the hair was pulled out by force. Furthermore, hair analysis could also reveal the origin of the person by just analysing the shape and pigment of the hair. For example, Asians and native Americans have round hair shaft as well as straight large pigment granule, patchy distribution of pigment and usually has continuous medulla. Meanwhile, Europeans and Caucasians have slightly round to oval hair shaft (straight to curly) with finer pigment granules and a more even distribution of pigment with the absence of fragmented medulla. African Americans have a flat to oval hair shaft (curly to kinky). Furthermore, the African American have the densest pigment granules which are unevenly distributed and with the absence of fragmented medulla (Robertson, 1999).

2. Research Methodology

The main objective of this article is to review the issue admissibility of hair forensic evidence in criminal cases, particularly in Malaysia. The article employed qualitative design with pure legal approach in achieving the said objective. The method of content analysis and critical analyses are chosen as the relevant methods for this article. The legal content relevant to the scope of this article is analysed critically to explain the position of forensic hair evidence in criminal cases (Ramalinggam Rajamanickam et al. 2015; Ahmad Azam Mohd Shariff et al., 2019).

3. Technology and Technique Used in Identifying a Suspect in Criminal Cases

The hair of a suspect is picked directly from several areas on the head and also by combing pubic hair to analyse the hair found in a criminal scene. The hair collected from the crime scene will normally be first examined under a microscope to determine if the hair is of human or animal origin (Deedrick, 2000). If the hair comes from a human being, a forensic analysis will also use a hair to microscopically compare it with the hair taken from a suspect or a victim to determine the identity of the suspect or the victim. The analysis employs a range of instrumentation tools in the analysis of hair evidence. Examples of the tools used are stereoscopic microscopy, polarized light microscopy (PLM) ultraviolet light microscopy, scanning electron microscopy, Fourier Transform infrared spectroscopy (FTIR), gas chromatography/mass spectrometry (GC/MS), pyrolysis gas chromatography and microspectrophotometry (MSP, n.d).

While, for many years, microscopic hair comparisons has been carried out, there is possibility of error in the comparison. Depending on the microscopist's training and experience, and the condition of the evidence, the potential rate of error of the technique is very low. Such examination cannot therefore identify the suspect conclusively (Houck et al, 2004).

Professional standards for forensic hair comparisons have been provided through international cooperation supported by international symposia for example, the Proceedings of the International Symposium on Forensic Hair Comparison, FBI Academy, Quantico, Virginia, 25-27 June 1985), which lays down safeguards for the analysis of hair comparisons in forensic laboratories (Houck et al, 2004). However, unlike other forensic techniques, such as forensic firearms tests, fingerprints and DNA analysis, the microscopic hair comparison examination cannot identify a person's hair positively, to the exclusion of all other individuals who may have the same hair morphology from the person whose hair sample was examined. Thus, even though the qualified expert can easily explain the nature and complexity of the inferences, the hair comparisons could be mistaken for their subjective nature (Houck et al, 2004).

However, these types of evidence usually depend on the lifestyle of the suspect from whom such hair samples were taken and if the suspect changed his or her lifestyle or eating habits, this could lead to a deficiency in some of the bio-minerals in the hair, which in turn could cause difficulties in identifying the suspect positively on the basis of the content of the hair mineral alone. In contrast to microscopic hair comparison and hair mineral analysis, DNA hair analysis can lead to positive individual identification, as the DNA characteristic is unique and differs from one person to another. Therefore, no two people could share the same DNA characteristic unless they are twins, but such evidence is not without any flaws because the DNA samples taken from a suspect for matching with the DNA samples found at the crime scene can be accidentally mixed up with another DNA in the laboratories, especially when the DNA samples are taken from the suspect are not kept in the proper marked container or bags. As such, although the potential of error in DNA hair analysis are not as great as microscopic hair comparison, but there is still a viability of human error in such DNA analysis, which should not be ignored. While the hair evidence is important for the investigation purposes, the question may arise as to its admissibility in court. The discussion on this will be elaborated in the next paragraph.

4. Admissibility of Hair Forensic Evidence in Criminal Cases

In Malaysia, DNA evidence has been widely adduced and admitted in courts (Ahmad Azam Mohd Shariff et al., 2019). The importance of hair evidence to identify the victim or the suspect in criminal cases makes the evidence pertinent in court can be seen in *Mohd Zuki Bin Ali @ Mohamad v Public Prosecutor [2010] MLJU 1320* where the court held that "The principle behind all scientific detection assumes that 'every contact leaves a trace' that is, a criminal usually leaves something at the scene of the crime and conversely, it takes something away with him. Among others, hair plays an important part, along with bloodstain and other scientific evidence". However, the physical evidence of hair found at the crime scene alone is not useful, unless the expert has scientifically analyses the hair and the result being scientifically compared with the suspect or the accused hair to obtain a match or the result being compared with the victim's family to determine the identity of the victim. Therefore, although hair found at the crime scene is relevant and admissible, but such evidence is dependent on the testimony given by the hair comparison experts or by the chemists who had somewhat scientifically examined such hair. The evidence provided by a hair expert or a chemist is relevant for the purposes of section 45 of the Evidence Act 1950 (Ramalinggam et al, 2019). The full text of the section is reproduced below:

When the Court has to form an opinion upon a point of foreign law or of science or art, or as to identify or genuineness of handwriting or finger impressions, the opinions upon that point of persons especially skilled in that foreign law, science or art, or in questions as to identify or genuineness of handwriting or finger impression, are relevant facts...

It is relevant to help the court to form an opinion on the hair found at the crime scene, as the opinion of the courts on the hair is based on the scientific analysis of the hair carried out by such experts. However, it is important to note that hair evidence does not prove the commission of crime by the accused, it is only a circumstantial evidence that puts the accused in the vicinity of the victim and the crime scene. Therefore, it is prudent that the evidence of hair experts should be treated with caution because such hair evidence is not conclusive as was emphasised in *Public Prosecutor v Mohamed Kassim Bin Yatim (1977) 1 MLJ 64* where the court held that "evidence of expert can never go beyond an opinion and can never be of absolute certainty. It has always been accepted that expert evidence especially of handwriting can never be conclusive.". Since hair evidence is circumstantial in nature, the probative value to be given to such evidence does not depend only on such evidence but must take into account other relevant factors that may differ from one case to another as was ruled in *Dr. Shanmuganathan v. Periasamy s/o Sithambanan Pillai (1997) 3 MLJ 61*.

Notably, expert evidence is not conclusive and should be supported by direct or other circumstantial evidence as explained in *Public Prosecutor v Mohamed Kassim bin Yatim (1977) 1 MLJ 64* where Hashim Yeop A Sani. J held; "It has always been accepted that expert evidence especially of handwriting can never be conclusive. But the proper way to assess the evidence in this case would be to see whether the court could act on such evidence if there was corroboration either by direct evidence or circumstantial evidence...". The same principle was asserted in *Ronny bin Abdullah v Public Prosecutor and Another[2011] MLJU 1519*, where the pubic hair specimen taken from the deceased matched with the sample of pubic hairs taken from the accused and this evidence, together with the other evidence, placed the accused in close proximity to the commission of the crime and subsequently enabled the court to convict the accused on murder. In the case of *Ong Hooi Beng & Ors v Public Prosecutor [2015] 3 MLJ 812*, traces of methamphetamine were found on the accused fingernails, hair and clothing. The court held that the probative value of the evidence shows that the accused was involved in the processing of drugs at the factory. The same principle was applied in *Chew Wai Kong & Anor v Public Prosecutor [2018] MLJU 174*, where the Court found the accused guilty of murder and amongst the evidence adduced during the trial was the DNA profile on the hair sample taken from the deceased house matching with the second accused. Although the defence argued that the presence of the hair of the second accused at the deceased house did not identify positively the second accused as a murderer, the Court still convicted the second accused on the basis of the other evidence. This case indicates that although hair evidence has a probative value in placing the accused in the vicinity of the crime, such evidence should be treated with caution and other evidence should be considered too in deciding the guilt of the accused.

Besides, DNA extracted from the hair samples at the crime scene can in some cases help to exonerate an accused. For example, in the case of *Magendran a/l Mohan v Public Prosecutor [2011] 1 CLJ 805*, the Federal Court allowed a conviction for murder to be set aside since the DNA samples of blood, hair and semen recovered from the crime scene did not positively connect the accused and there was no further evidence connecting the accused with the deceased body.

In addition, hair DNA examinations have been used in America to solve old cases, especially in cases where the crime was committed long before DNA profiling was discovered. One of these cases was the James Anagnos murder on 18th October 1977. The police found James Anagnos' hand clenching a strand of hair, but since DNA profiling has not been discovered at that time, the police could not connect the hair to any person. However, subsequent DNA profiling test confirmed that the hair found in James Anagnos' hand belonged to Frank Wright (CBS Los Angeles, 2010). Further, mitochondrial DNA testing of hair shaft was able to solve the brutal rape and murder of 16 years old Leanne Tieman and such evidence led to the conviction of her killer (Elvidge, 2016).

In some cases, however, it appears that the courts in Malaysia prefer to accept the evidence of experts as the truth, in particular about the expert analysis of scientific evidence, even though the defense has adduced rebuttal evidence on such scientific evidence as was decided in *Dato' Seri Anwar Bin Ibrahim v Public Prosecutor and Another Criminal Appeal (2015) MLJU 34*. The court had relied heavily on the presumption in illustration (e) of section 114 of the Evidence Act 1950 in accepting such scientific evidence. Section 114 of the Evidence Act 1950 "The Court may presume the existence of any fact which it thinks likely to happened, regard being had to the common sense of natural events, human conduct, and public and private business, in their relation to the facts of the particular case – illustration (e) – that judicial and official acts have been regularly performed." Illustration (e) of section 114 of the Evidence Act 1950 allows the court to presume that the scientific analysis, such as hair comparison analysis and hair DNA evidence conducted by government experts to have been regularly performed without any mistakes as was established in *Public Prosecutor v Muhammad Rasid bin Hashim (2011) 7 MLJ 845*. Thus, by accepting the testimony of the expert witness, the courts had chosen to blind itself with respect to any cogent rebuttal expert evidence adduced by the opposite party. Although in the case of *Munusamy v Public Prosecutor [1987] 1 MLJ 492*, the Supreme Court held that scientific evidence of a technical or complicated nature should not be accepted on the face value of it but the subsequent court decision in the case of *Dato' Seri Anwar bin Ibrahim* appears to accept technical and complicated scientific evidence on the face value of the evidence.

However, the danger of accepting such technical and complicated scientific evidence on its face value, especially in relation to hair comparison, has led to many wrongful convictions, for example in the United States (Garrett, & Neufeld, 2009). An example of this is shown in the case of George Parrot where he was convicted for the rape of 78 years old, Mary Prekop in Springfield, USA based on strand of hair found on the victim's bed. The hair comparison expert from the Federal Bureau of Investigation (FBI) testified that the microscopic hair analysis from the strand of hair taken from the crime scene matches with George Parrot. However, subsequent evidence showed that such microscopic hair analysis was flawed and that such hair analysis could not prove positively and conclusively that the hair was found to be from George Parrot at the crime scene (Associated Press, 2017). In another instance, Santa Tribble was tried, convicted and sentenced to 28 years to life in prison for robbery and murder of a cab driver in Washington D.C. based on the microscopic hair analysis and Santa Tribble had to serve 28 years in prison until subsequent DNA examination showed that the hair strand at the crime scene did not match Santa Tribble. In fact, the DNA examination showed that the hair was from a dog. Although Santa Tribble was subsequently exonerated from the crime, but he had already spent about 28 years in prison (Rivero, 2015). Similarly, in the case of Ralph Armstrong, who served 29 years in prison for the brutal rape and murder in Madison, after Wisconsin State microscopic hair expert testified that the hair found on the victim was consistent with that of Armstrong. However, subsequent DNA examination showed that the hair found at the crime scene was not that of Armstrong (Hall, 2017). The above cases clearly showed that the acceptance of forensic evidence completely on its face value by court, especially on the evidence of microscopic hair comparison evidence, can lead to the miscarriage of justice and therefore such evidence ought to be accepted cautiously. The court should consider other direct or circumstantial evidence as well before determining the guilt of the accused.

The expert in providing evidence of microscopic hair comparison should explain the details of how this test was performed and the likelihood of its accuracy and otherwise. However, this appears to be contrary to the Malaysian Supreme Court's decision in the case of *Munusamy v Public Prosecutor [1987] 1 MLJ 192*, where the court stated that it should not investigate the details of the procedure carried out in the laboratory if the expert can provide credible evidence in support of the expert opinion.

However, that part of the decision in *Munusamy* can be said to be only limited to non-technical or non-complicated forensic analysis of physical evidence and does not extend to complicated forensic analysis of physical evidence such as microscopic hair comparison. This is because as seen in numerous cases in America, such experts have a tendency of exaggerating the probative value of microscopy hair comparison evidence in their own testimony (Robertson, 1999), although such experts are well aware that microscopic hair comparison could not positively identify the hair found at the crime scene with the accused to such an extent as the DNA profiling could do (Saks & Risinger, 2003). Therefore, in recent years, many of the American cases where the conviction was substantially founded on the hair comparison analysis had been subsequently overturned by the court after DNA profiling examination on those hair is carried out. In the past, the admissibility of hair evidence, especially the microscopic hair comparison evidence in the USA was based on the *Frye v United States 293 F. 1013, 1014 (1923)* general acceptance test, where according to the *Frye* general acceptance test, scientific evidence by experts are only accepted if such scientific analysis or examination are generally accepted as reliable by the relevant scientific community. In *Terry M. Johnson v Commonwealth of Kentucky, 12 S.W.3d 258 (1999)*, the Kentucky Supreme Court upheld the admissibility of hair evidence merely because microscopic hair comparison evidence had been accepted by other Kentucky Courts and other state courts. In fact, the Kentucky Supreme Court held that the court could take judicial notice that microscopic hair comparison evidence was a reliable science. Thus, there is no necessity to prove the reliability of such evidence. The Kentucky Supreme Court rejected the defense argument that unlike DNA analysis, microscopic hair comparison analysis is dependent on the skills of the person making such comparison and it is merely based on the subjective view of an expert, which does not involve objective examination of hair (Cary, 2009).

Therefore, if the court could assume that such evidence to be reliable, even though such microscopic hair comparison evidence is dependent on the subjective skill of an expert, then it is clear that the accused's future in such cases both literally and figuratively can be said to be hanging by a hair (Mills et al, 2018). It is suggested that judicial presumption of such microscopic hair evidence should only be reversed in a rare occasion and the test founded in the case of *Daubert v Merrell Dow Pharmaceuticals Inc. 43 F. 3d 1311 (9th Cir. 1995)* is more appropriate especially when it comes to microscopic hair comparison evidence. In *Daubert*, the *Frye* general acceptance test was held to be incompatible with the Rule 702 of the US Federal Rules of Evidence which states "A witness who is qualified as an expert by knowledge skill, experience, training, or education may testify in the form of an opinion or otherwise." Further, in *Daubert*, the court held that in considering

the admissibility of forensic scientific evidence, it is prerequisite to establish that such scientific evidence is reliable, and this requires the trial judge to ensure that the scientific analysis or technique are founded on reliable foundation.

Therefore, the approach with respect to the admissibility of forensic evidence in Malaysia, especially microscopic hair comparison evidence from the expert ought to be only admissible if it satisfies the requirement as set out in the case of *Daubert*, which is more stringent than the test formulated by the Supreme Court in the case of *Munusamy*. However, whichever tests that are used, it is important that court should guard itself from over exaggerating of such evidence by the experts.

5. Conclusion

Based on the above discussion, although hair forms an important piece of physical evidence but the admissibility and the probative value to be attached to hair expert witness, especially in cases of microscopic hair comparison ought to be considered cautiously to avoid wrongful conviction as was evident in George Parrot, Sante Tribble and also in the case of Ralph Armstrong in the US. However, although DNA examination had taken over microscopic hair comparison examination, which proves to be more accurate and reliable, the court in Malaysia should not blindly assume that such DNA examination had been properly conducted without any evidence as to the way the test is conducted and the reliability of such method in producing an accurate result. Furthermore, if the court relied too much on the presumption as set out in illustration (e) of section 114 of the Evidence Act of 1950 in accepting forensic evidence, then it will not take too long until Malaysia follows the same faith as in America, where there would be fears of cases of wrongful convictions, especially in cases where the conviction is based solely on the assumption that the testimony of the forensic expert is correct, without any other corroborating evidence.

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