

***BRIDGING THE GAP BETWEEN IDEAL AND PRACTICAL SEXUAL  
INVESTIGATION - A MEDICO LEGAL ANALYSIS***

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**ABSTRACT**

Rape is a heinous crime that can be committed against a female and it destroys the self-esteem and confidence of an individual, the least that can be done in such a situation is make sure the perpetrator is convicted. Legal system of India outlines certain laws like section 375, 376 and 377 of Indian Penal Code and evidence like blood, semen, saliva, hair, nail, etc that can be used and also the protocol for testing the said evidence. However, at times due to physical, legal or scientific limitations the protocols are not carried out as per the standards established and the evidence thus presented are disregarded. At such times, the victim faces humiliation inflicting more harm on her will to live. This paper discusses the value of semen in rape cases and challenges faced by Indian judiciary in proper usage of semes or rather DNA as a primary evidence. The proper techniques for analysis of semen as evidence and extraction of DNA from semen are also discussed meticulously. Along with this various challenges and limitations faced by the legal system have been highlighted. A few cases have also been discussed where the legal systems have been successful in finding a way around some problems due to the legal provisions provided to an individual.

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## INTRODUCTION

Rape is a sexual offence perpetrated by the overuse of sex organs of one gender over another and more frequently than not female tend to be the victim. Proper execution of legal provisions meant for safeguarding the female and also giving quantifiable evidence for conviction is necessary. It also violates the victim's most prized fundamental right, the Right to Life, as enshrined in Article 21 of the Indian Constitution.<sup>1</sup> The primary motivation behind this offence is to degrade a woman's esteem. In a rape case, the investigating officer should seize the victim girl's (or women's) clothes that were/are worn below the waist because those clothes might contain sperm stains. This should be done as soon as possible because the stains on those clothes may evaporate if they are washed, and the entire investigation may be thrown out. They may be subjected to torture in their own homes, police stations, and hospitals, where they may be subjected to invasive medical tests that often serve no purpose other than to weaken their case later in the judicial process. Rape is defined in Section 375 of the Indian Penal Code, 1860 as a sexual illegal sexual relation with a female induced by penetration of a male's penis into the female's vagina. According to Section 375 of the Indian Penal Code, 1860, as amended by the Criminal Amendment Act 2013,

- *“Penetrates his penis into the vagina, mouth, urethra, or anus of a woman to any extent, or forces her to do so with him or any other person”*
- *“Puts any object or portion of the body, other than the penis, into a woman's vagina, urethra, or anus, or forces her to do so with him or another person, to whatever extent”*
- *“Manipulates a woman's body in order to create penetration into her vagina, urethra, anus, or any other portion of her body, or forces her to do so with him or another person”*
- *“A male puts his lips on a woman's vagina, anus, or urethra, or forces her to do so with him or another person”*

DNA analysis in forensic science deals with the use of DNA, which contains the genetic coding for all the living organisms as a method of establishing contact between a crime scene and an individual. DNA can be recovered from all biological material like hair,

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<sup>1</sup> Constitution of India, 1950.

nails, blood, semen, saliva and even from fingerprints making it the most abundant evidence on the crime scene. From the time it was introduced in the criminal justice systems, DNA analysis and fingerprinting has played a pivotal role in convicting the guilty and exonerating the innocent. Research and development are constantly being carried out to find new full proof techniques with improved sensitivity which may also give more information. PCR or polymerase chain reaction techniques are used to amplify the low copy number DNA from the crime scene. This technique is automated and is thus accepted worldwide as a standard equipment for DNA processing. PCR uses STR that is short tandem repeats to analyse the genetic markers and electrophoresis is used to separate the different loci and compare with the control sample from the suspect.

### **SEMEN ANALYSIS – THE IDEAL PROCEDURE**

The semen and the ejaculatory fluid contain DNA that can help identify the suspect. This method is used extensively in rape cases. However, traditional methods are not really ideal for the extraction of DNA from the semen. The DNA packing of the sperms is unique and makes it almost resistant to the traditional isolation techniques used for somatic cells. Hence many rapid isolating techniques have been developed which are much more sensitive than the original ones.

#### **2.1. PRESUMPTIVE TEST**

Presumptive tests, commonly known as preliminary tests are colour changing tests. They help in the process of elimination and give a general idea of what a substance could be. Tests are fast and involve less steps and do not require any sophisticated equipment and can be performed on the field. They are highly sensitive but not specific in nature. Thus confirmatory tests are mandatory to be done after the presumptive tests. However, presumptive tests determine which confirmatory tests should be done and thus narrows down the amount of tests to be performed.

#### ***Presumptive tests for Semen are***

##### **Acid phosphatase test (AP Test)-**

Acid Phosphatase enzyme acts as a catalyst in hydrolysis of phosphate compounds which reacts with a salt chromogen to give a colour change. One of the common

reagents used in the process is alpha-naphthyl phosphate and Brentamine Fast blue. On adding this reagent to seminal fluid, a colour changes from colourless to purple. However, this test is not sensitive to seminal fluid and false positives are seen in case of presence of vaginal fluid, some plant material, etc.

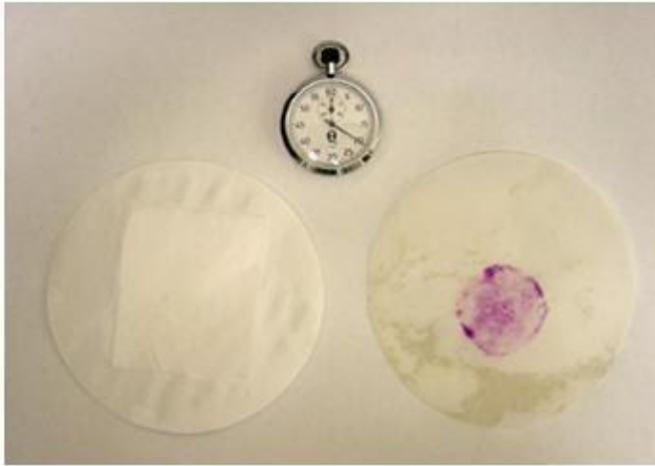


Fig. 1: AP Test showing colour change<sup>2</sup>

### CONFIRMATORY TEST –

Confirmatory tests are used to confirm the presence or absence of a particular substance detected in the presumptive tests. These require some amount of instrumentations and are not field tests. They are very specific in nature. The confirmatory tests that are done are chosen on the basis of results from the preliminary test.

Some of the common confirmatory tests for Semen are

### Prostate Specific Antigen test (PSA Test)-

The most common confirmatory test is the PSA Test. This test can be used even if the male is azoospermic. Since this antigen is present only in seminal fluid, presence of other body fluids does not interfere in the results. This test is very specific and thus false positives are rare. False positives occur only due to presence of male urine in the samples. A small quantity of sample is put on the test kit and let it run across the kit. Presence of two bands (control and test bands) confirms the presence of Prostate specific antigen.

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<sup>2</sup> Image source: <https://www.njsp.org/division/investigations/forensic-serology.shtml>



Fig 2: PSA test result<sup>3</sup>

### Microscopic analysis of Sperm

This is the most reliable technique for identification of sperm cells. To make the sperm visible, the heads of the sperm are stained with the Christmas tree stain. It stains the head of the sperm red and its tail green. Proteinase K can also be used to help in the staining process. However, if the donor is Azoospermic or has undergone vasectomy, microscopic examination is not at all effective. Based on the amount of sperms visible, the sample is decided to be good or bad.

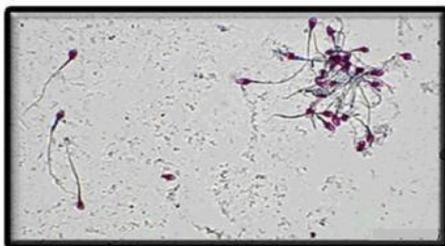


Fig. 3: microscopic analysis of semen<sup>4</sup>

### ISOLATION OF SPERM

<sup>3</sup> Image source: <http://semenswab.com/FAQ.htm>

<sup>2</sup> Image source: <https://www.njsp.org/division/investigations/forensic-serology.shtml>

The semen is usually a mixture of the somatic cells and sperm cells. Thus the somatic cell contamination is removed by isolating the sperm cells using a continuous one step 90% gradient. The sample obtained from this is washed once and re suspended on a haemocytometer. This suspension is visually inspected for somatic cell contamination. The sperm obtained can be anywhere between 20 to 109 million.

### CELL LYSIS

Reducing agents like Tris (2-carboxyethyl) phosphine, dithiothreitol, 2-Mercaptoethanol are added to the 500  $\mu$ L of the sample. This mixture needs to be homogenized. There are various methods that can be used to do this. In one of the methods, the sperm cells are homogenized in the presence of a buffer called the lysis buffer and 0.1g of 0.2mm stainless steel beads for 5 mins on a machine called Disruptor Genie. The aliquots produced need to be divided equally to avoid false results. To ensure this, the sperm cells are vortexed for 10s between each aliquot. This method avoids suspension of the sperm in the aliquot.

### DNA ISOLATION

Many kits are available for this process. The kits are pre-programmed to amplify a certain number of loci. The kit most commonly used across the labs is

#### Quick-gDNA MiniPrep

DNA /RNA Shield and Quick gDNA Genomic Lysis Buffer (included in kit), are used for sperm lysis instead of Buffer RLT. Samples in the Genomic Lysis Buffer are loaded onto the columns, while samples in DNA /RNA Shield are combined with 3 volumes of Genomic Lysis Buffer before being loaded onto spin columns. Samples are centrifuged at  $10,000 \times g$  for 1 min to bind. The samples extracted are washed as per the protocol by the manufacturer and the volume of the sample is made up to 100  $\mu$ L. DNA yields and quality are determined using the Nanodrop 2000 Spectrophotometer.

### DNA METHYLATION ANALYSIS

DNA methylation is a process where methyl groups are added to the DNA. Adding methyl groups can repress the transcription without changing the DNA sequence thus

no alteration of the tetra nucleotide sequence takes place. RNA primers are introduced in the sequence by this process, thus marking the specific loci that needs to be amplified before running the specimen of electrophoresis.

## INTERPRETATION OF RESULTS

The DNA results obtained can be a single as well as a mixed sample. The profiles obtained can be a complete or a partial profile. A complete profile is the one where all the locus have been accounted for and all the alleles have been identified, that is there are either 2 peaks for an allele in case of heterozygous or there is 1 tall peak indicating homozygous condition.

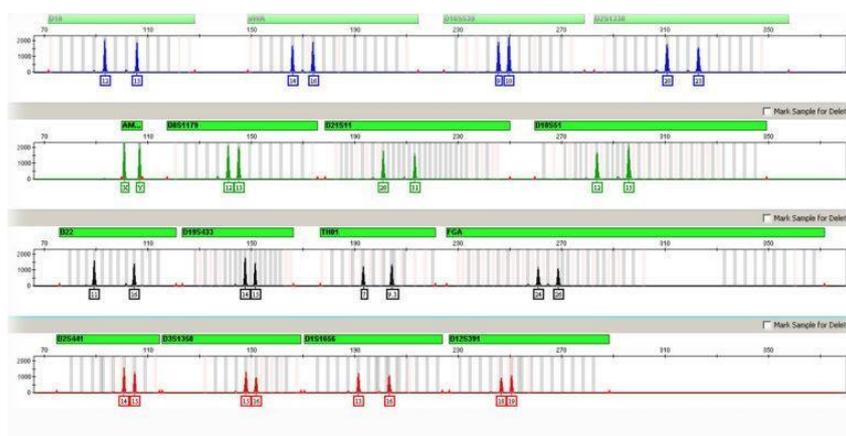
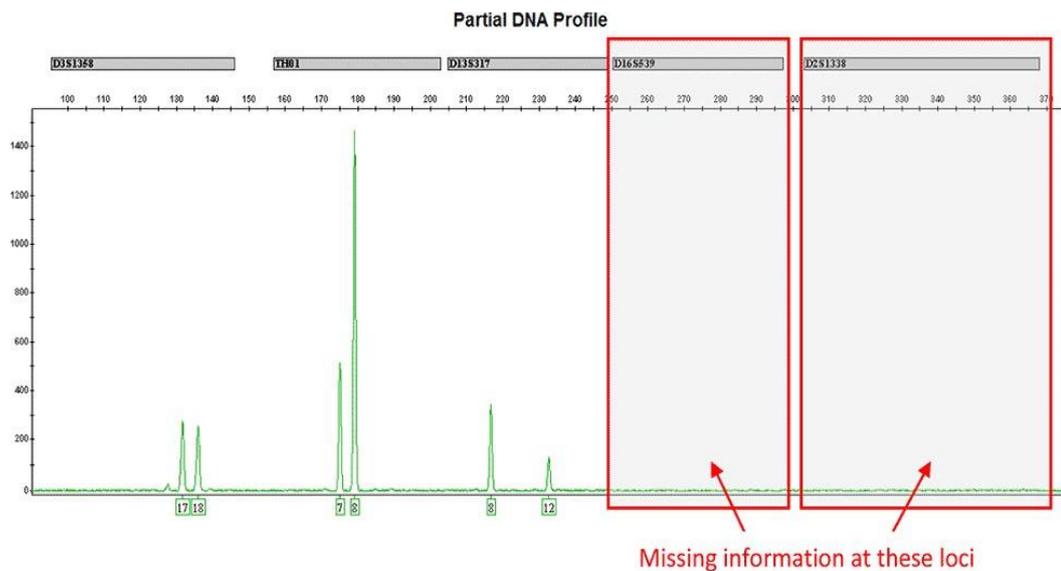


Fig. 4: Complete DNA Profile<sup>5</sup>

<sup>5</sup> Image source: <https://www.ifscolorado.com/dna-profiling-consultancy/>



Electropherogram data generated using Life Technologies® GeneMapper® software from Thermo Fisher Scientific Inc.

Fig. 5: Partial DNA Profile<sup>6</sup>

The main identification point of distinguishing between a mixed and a single profile is the presence of more than two bands under one or more loci. Sometimes the difference in height or area of the allele is also considered to distinguish between mixed and single profile in case of a homozygous allele. However if the third peak is below the threshold RFU, then it is discarded as noise or stutter peak. But in case of low copy number DNA or trace DNA it is difficult to distinguish between the minor contributor and the stutter peak. Thus a DNA profiling is more accurate in case of a single profile and less accurate in case of mixed profile.

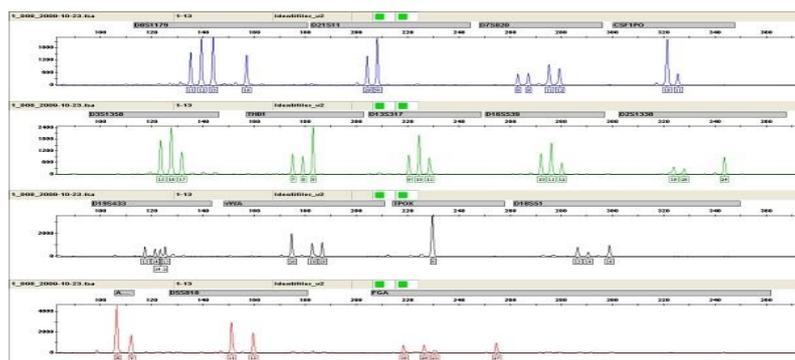


Fig. 6: Mixed DNA profile<sup>7</sup>

<sup>6</sup> Image source: <http://www.forensicssciencesimplified.org/dna/img/Partial-DNA-Profile.png>

<sup>7</sup> Image source: [https://www.researchgate.net/figure/Mixed-DNA-profile-of-a-perpetrator-in-a-sexual-assault-case-obtained-by-the-routine\\_fig1\\_51220793](https://www.researchgate.net/figure/Mixed-DNA-profile-of-a-perpetrator-in-a-sexual-assault-case-obtained-by-the-routine_fig1_51220793)

## **DRAWBACKS AND CHALLENGES**

### **SCIENTIFIC CHALLENGES-**

- Low copy number DNA samples
- Samples with DNA polymerase inhibitors
- Hydrolytic as well as oxidative damage
- Allelic drop in and allelic drop outs

### **HUMAN ERROR CHALLENGES-**

- Degraded DNA samples
- Contamination of samples in any of the extraction processes
- Mixed DNA samples
- Storage conditions
- Improper maintenance of chain of custody.

### **LEGAL CHALLENGES-**

One of the most important legal issues is the “Right against Self-Incrimination”, which is granted by “Article 20(3)” of the Indian Constitution<sup>8</sup> and prohibits an accused person from supplying evidence against oneself in criminal situations. The basic right provided by Article 20(3) acts as a shield against testimonial coercion in the case of those accused of crimes who are forced to testify against themselves. The protection is provided not just for evidence supplied in a court trial, but also for evidence given at a prior stage if the person is accused at the time the statement is made. However, Article 20(3) protects against self-incrimination only when coercion is employed, not when a voluntary declaration, revelation, or production of a document or other information is made.

The other issue is the actual evidentiary value. DNA is not considered definitive proof, but rather an expert judgement that can be used to corroborate other evidence. Expert opinion must be relevant and admissible, according to the Indian Evidence Act of 1872. “An expert is a person who has committed time and study to a certain field of knowledge and is thus particularly knowledgeable about the topics on which he is asked to comment”. There are no legal requirements that establish how much experience or certification a person must have to be considered an expert.

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<sup>8</sup> Constitution of India, 1950.

Acceptance of a witness as an expert may be based on a number of factors, including

1. Expertise, which includes academic achievements, professional training, trade experience, available resources, and the use of those resources to reach a judgement.
2. Clarity, which includes the avoidance of jargon, the use of plain language, and proof in the form of images, charts, and sketches, among other things, in order for his viewpoint to be understood by a layperson.
3. Relevancy entails not only the assumption of facts, but also the drawing of conclusions from personal experience or published works by qualified writers.

### **LIMITATIONS OF LEGAL SYSTEMS-**

Despite this hopeful trend, the numbers remain alarmingly low, and, as previously said, significant efforts must be made to incorporate DNA evidence in all instances. As observed by the trial of rape cases through the years, there appears to be a few gaps in the system established.

Firstly, with umpteen number of rape cases piled up over the years, a lack of infrastructure seems to be an obstacle. In India, only a few laboratories and diagnostic institutions have the necessary equipment for DNA testing. Because all states depend on these laboratories to do the tests, the analysis speed is severely hampered, and a significant delay occurs.

A shortage of skilled personnel to work with DNA is an impediment in this area. DNA profiling is a sophisticated scientific method, according to Dr. G.K. Goswami, and its success is dependent on the ability and knowledge of the Investigation Officer, who is the first person in contact with the "sample," and if he is unsuccessful to do so, the diagnostic center's entire operation is thrown out.

Even the techniques in laboratories should be standardised, and uniform approaches in DNA probing should be used to eliminate the possibility of ambiguity or incorrect findings. The courts could not depend on DNA results because of discrepancies or illogical findings in some cases. Insufficient samples, incorrect preservation procedures, excessive examination delays, non-functional tools, and other issues have been identified as serious roadblocks to relying on DNA evidence in courts.

Finally, sufficient awareness and knowledge of the intricacies of DNA technology may be created among the judicial community. In the face of other evidence, courts have

been known to dismiss DNA findings. As a result, the court considers the parties actions, motives, and declarations for more significance and weight than scientific results. Unfortunately, the former is unreliable, whereas the latter is precise and accurate. The Courts are expected to respond to scientific developments and their proper intervention in the administration of justice.

## **CASE STUDIES**

### **Kathua Rape Case**

A noteworthy case where DNA evidence proved to be of immense importance is the Asifa Bano rape case of Kathua village of Jammu Kashmir. According to the complainant Mohoammad Yusuf (father of victim), Asifa had gone to watch over grazing horses and was last seen at 2PM. Later on 17th January 2018, the body was found. Post Mortem revealed that the victim's body contained traces of Clonazepam. The girl had been given a sedative before she was raped and murdered, according to the physicians' assessment. According to forensic evidence, she was held captive for several days by Sanji Ram, one of the criminals charged. Hair strands found in the temple matched those removed from the girl. Asifa had been raped numerous times by various men, strangled to death, and beaten in the skull with a hefty stone, according to the forensic analysis. The Delhi Forensic Science Laboratory examined 14 evidence packs comprising vaginal swabs, hair strands, blood samples from four defendants, the girl's viscera, and other items. Later, based on this evidence, six out of the seven defenders were convicted.

### **Ananth Kumar Naik v. State of Andhra Pradesh**<sup>9</sup>

When assessing the scope of Section 53 of the Code<sup>10</sup> In this case, the Court stated that "examination of a person by a medical practitioner must logically take in examination by testing his blood, sperm, urine, and other bodily fluids." The court also pointed out that Section 53 of the law allows for the use of reasonable force in conducting such an examination. As a result, any suffering experienced by an arrested

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<sup>9</sup> Ananth Kumar Naik v. State of Andhra Pradesh, 1977 CriLJ 1797

<sup>10</sup> Code of Criminal Procedure, 1973.

individual when blood and sperm samples are obtained would be justified under the requirements of Sections 53 and 54 of the Code.<sup>11</sup>

### **State of Bombay v. Kathi Kalu Oghad**<sup>12</sup>

The Hon'ble Supreme Court considered a similar question in relation to Article 20(3) of the Indian Constitution in the well-known case of State of Bombay v. Kathi Kalu Oghad. In connection to oral evidence, it is ruled that "becoming a witness" entails "imparting information in respect of important facts by a person who has personal knowledge of a fact to be communicated to a Court." It was also pointed out that Section 139 of the Evidence Act<sup>13</sup> recognises the difference between producing a document and being a witness, stating that "a person summoned to produce a document does not become a witness by mere fact of producing it and cannot be cross examined unless and until he was called as a witness." Later the Hon'ble Supreme Court came to a conclusion that 'being a witness' is not the same as 'furnishing evidence' hence relevant for proving guilt or innocence.

### **CONCLUSION**

Even though the genetic code of humans are very similar, there is a small proportion of the coding that is individualistic and can be used to solve a wide range of problems. Even though the development of DNA fingerprinting happened decades ago, it is still used as a key evidence in linking suspects to the crime, identification of individuals in case of mass disaster and also in the verification of paternity. None of the methods can be 100 percent accurate. Thus with proper studies and understanding of the machines and processes, the errors can be minimized and DNA can prove to be a reliable source of information. With proper training to all the persons involved DNA can produce the most accurate results and tie the suspect to the crime and result in convictions

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<sup>11</sup> Code of Criminal Procedure, 1973.

<sup>12</sup> 1961 AIR 1808, 1962 SCR (3) 10

<sup>13</sup> Indian Evidence Act, 1872.

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