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FORENSIC SCIENCE IN ABSENCE OF TESTIMONIAL EVIDENCE

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FORENSIC SCIENCE

- Forensic Science is the use of science & technology for legal purpose
- 'Forensic Science' is the application of various basic sciences to provide scientific evidences to court of law

Locard's Principle of Exchange

1. "Whenever two objects come into contact, they always leave a trace on the other."
2. Every criminal can be connected to his crime by contact traces carried from the scene of crime or left by him at the scene of crime

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POCSO ACT

The Protection of Children from Sexual Offences Act (POCSO Act) 2012 was formulated in order to effectively address sexual abuse and sexual exploitation of children.

It is any sexual activity between adults and minors or between two minors when one forces it on the other.

This includes sexual touching and non-touching acts like exhibitionism, exposure to pornography, photography of a child for sexual gratification, solicitation of a child for prostitution and communication in a sexual way by phone, Internet or face-to-face.

- Child Sexual Abuse or CSA is often referred to as a "silent crime" because victims have difficulty coming forward
- In particular, children rarely disclose sexual abuse immediately after the event.
- Disclosure tends to be a process rather than a single episode and is often initiated following a physical complaint or a change in behaviour.
- Signs of genital trauma are seen in cases of gradual and multiple episodes of sexual abuse
- Definitive signs of physical and genital trauma is seen in case of involvement of physical force
- The evaluation of children requires special skills and techniques in history taking, forensic interviewing and examination

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CHILD FORENSIC INTERVIEW

Child Forensic interview is a formal, structured interview technique, that is used to investigate whether a child has experienced or witnessed physical or sexual abuse and if so, to get disclosure.

The interview is conducted by specialized interviewer:
a psychologist or a similar education

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The Goal of Child Forensic Interview...

...To get maximum information while causing minimum stress and contamination

... assist the child in providing detailed information

...on the nature and extend of the abuse, including those responsible

...sufficient details of the event to take appropriate action

The interviews are video recorded and audio recorded for further investigation purpose

Physical Examination

- The physical examination of sexually abused children is essential but should not result in additional emotional trauma.
- The examination should be performed immediately when the alleged sexual abuse has occurred within 72 hours, or there is bleeding or acute injury
- Even after 72 hours a physical examination is conducted as soon as possible
- Biological trace evidence are secured such as epithelial cells, semen and blood to maintain a “chain of evidence.”

In the rare instance when the child is unable to cooperate because of the trauma, infection, and/or the need to collect forensic samples are essential, sedation are used with careful monitoring.

Instruments to magnify and illuminate the genital and rectal areas are used

Signs of trauma should be carefully documented by detailed diagrams illustrating the findings or photographically.

Specific attention should be given to the areas involved in sexual activity—the mouth, breasts, genitals, perineal region, buttocks, and anus.

Thorough genital examination is conducted as per the gender of the child victim

Swabs and Smears

The purpose of making smears is to allow microscopic forensic analysis of the specimen to test for the presence of body fluids like blood, semen

Depending upon the type of sexual offense, semen may be detected in the mouth, vagina, or rectum.

Samples are collected from

- Clothing
- Perineum
- Anus
- Thighs
- Pubic area
- Bite injuries
- Finger nails
- ANY part of the victim's body (appropriately)

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Types of Samples

- Seminal stains
- Blood stains
- Loose Pubic hair
- Loose scalp hair
- Saliva from bite marks
- Nail scrapings
- Foreign material (e.g. Mud, Weeds)
- Blood for alcohol or drugs
- Few plucked pubic hair & scalp hair
- Trace material from genital areas

<u>An ultraviolet light may be helpful to scan the body and clothing to locate signs of semen</u>

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Types of Tests conducted with biological samples retrieved from the site and collected samples

- Elimination of victim's blood group
- Blood Group Analysis of the accused sample other than victim
- Blood can be tested for substance abuse
- Other samples can be collected for DNA Analysis
- Hair Strands are matched with the victim's and the suspect's hair strands
- Nail scraping are tested for presence of skin traces which can be taken up for DNA analysis
- Urine and Blood samples are collected within 96 hours of ingestion of drug.
- Samples collected are analysed for drugs
- Pregnancy tests are conducted from the samples

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Injury Marks

Physical examination of the child with an injury is important

Specially in cases where Injury pattern inconsistent with the history provided

The child is examined for

- Incised wounds
- Laceration
- Bruises (or contusions)
- Abrasions (or grazes or scratches)
- Bite Marks

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Bruises

A bruise is "a hemorrhage into tissues produced by the escape of blood from blood vessels".

Bruises may be found in the skin, muscles and internal organs

Bruising over bony areas is common in childhood, but specific patterns of bruising that raise the concern of abuse include:

Bruising of multiple areas of the body beyond bony areas

- Like ears, facial cheeks, buttocks, palms, soles, neck, genitals
- Bruises at many stages of healing
- Patterned markings resembling objects, grab marks, slap marks, human bites and loop marks

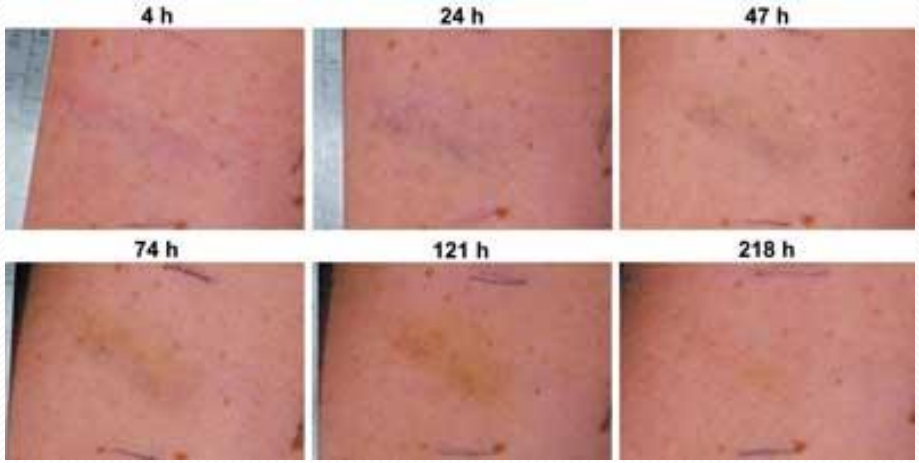
The shape of the bruise is most likely to reflect the shape of the causative object when the object is small and hard

Delayed Appearance

- Deep bruises may have delayed appearance at the skin surface
- Deep bruises may require as long as 12 or 24 hours to become apparent
- The more superficial the source of bleeding, the sooner the discoloration will be seen on the skin surface.
- In a living victim, a second examination in one or two days may show bruising.
- Therefore a second examination of the victim should be conducted after 24 hrs.

Indicative age determination of Bruises

- Colors result from breakdown of hemoglobin from tissues
  - Dark blue/purple (1-18 hours)
  - Blue/brown (~1 to 2days)
  - Green (~ 2 to 3 days)
  - Yellow (~3 to 7 days)
- This rate assumes person is healthy



Abrasions

- Friction injury removing skin or tissue
- An abrasion is "a portion of body surface from which the skin or mucous membrane has been removed by rubbing."

Types

1. Scratch - Caused by sharp instruments Eg. - pin, thorn, finger- nail . Head-clean seen at beginning and Tail- tagging of skin at end
2. Graze - Long parallel lines
3. Pressure abrasion / Impact abrasion - force object perpendicular to skin, Skin crushed and the surrounding area contused

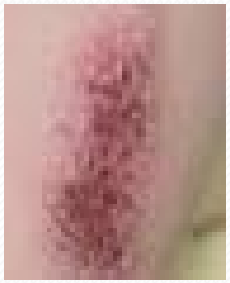
Medico-legal Points of Abrasions

- Nature of injury
- Site of impact
- Direction of force
- Patterned abrasion- identifies object
  a) eg.) elliptical/circular, 2-4 teeth bite with bruised intervening space
- Nature of crime from the site of abrasion
  a) Breast, genitalia & thighs-sexual assaults marks
  b) Neck-throttling
  c) Around mouth & nose-smothering
  d) Site of Crime-presence of mud, grass, straw etc.

Indicative Age Determination of Abrasions

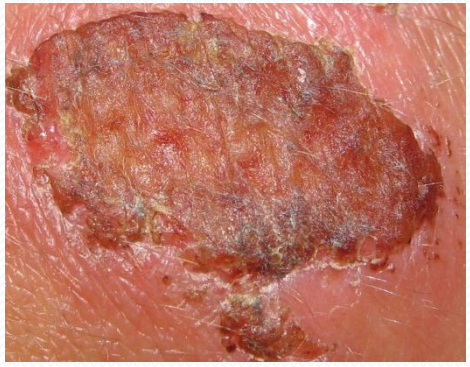
1. Fresh -bright red color

2. 12-24 hours -scab formation



3. 2 days -scab reddish brown color

4. 4-7 days-epithelium covers



5. After 7 days -scab falls off

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Bite Marks

- One of the important evidences in Child Sexual Abuse
- Bite marks, like fingerprints, are unique
- Bite marks can also provide saliva that can provide usable DNA samples which help making the identification of a suspect that much easier.
- A forensic dentist can tell a lot about the teeth of the biter based on the bite mark For eg. If there's a gap in the bite, the biter is probably missing a tooth. Crooked teeth leave crooked impressions, and chipped teeth leave jagged-looking impressions of varying depth. Braces and partials also leave distinctive impressions.

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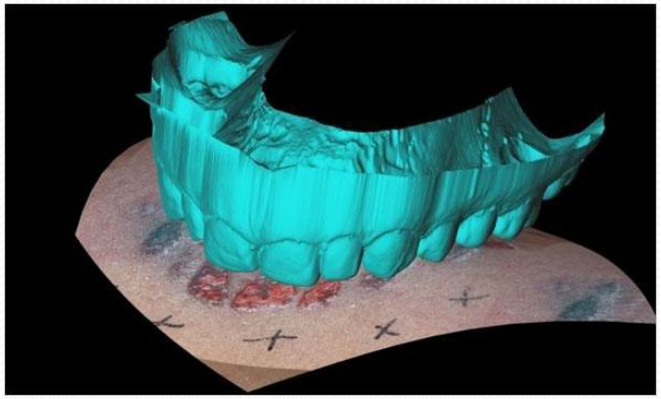
Analysis of Bite Marks

The first step in analyzing the bite is to identify it as human and then measured

The bite is swabbed for DNA, which may have been left in the saliva of the biter.

The investigators take mold of the suspect's teeth as well as photos of the mouth in various stages of opening and biting.

Then compare transparencies of the mold with those of the bite-mark cast, and photos of both the bite mark and the suspect's teeth are compared to look for similarities.



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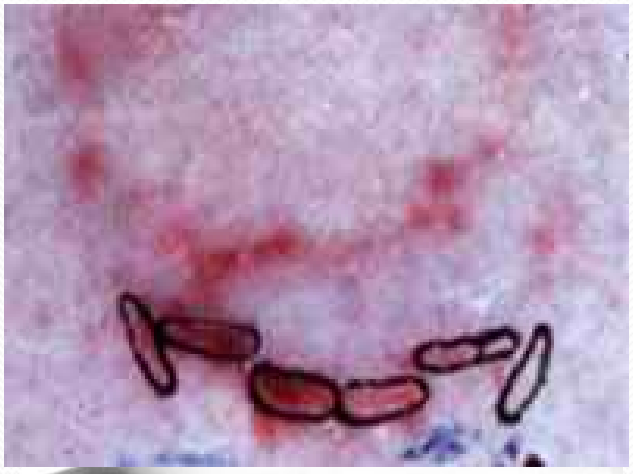
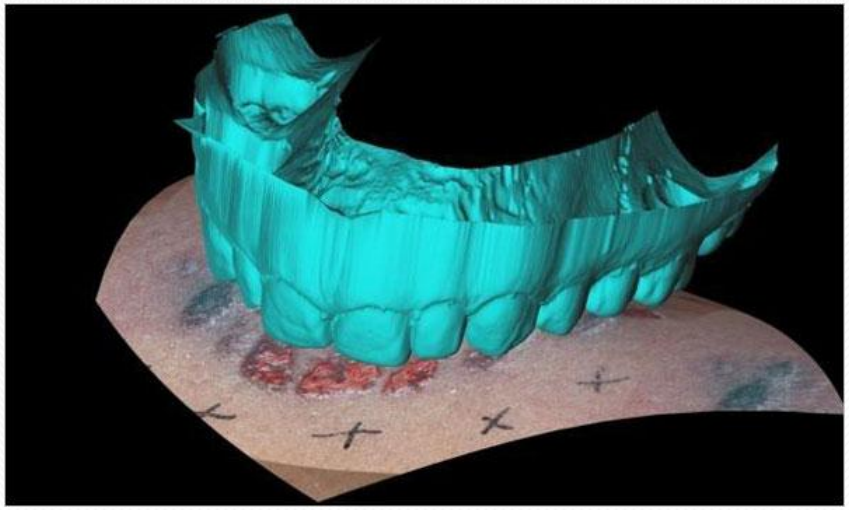
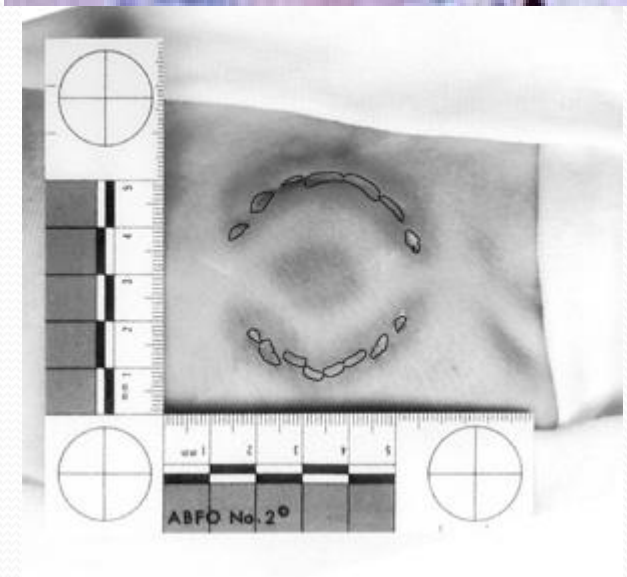
Analysis of Bite Marks... cont.

The bitemark and exemplar castings are compared for features like:

- Gaps
- Rotation (angle)
- Size of teeth (e.g. width at tip)
- Width from tooth to tooth







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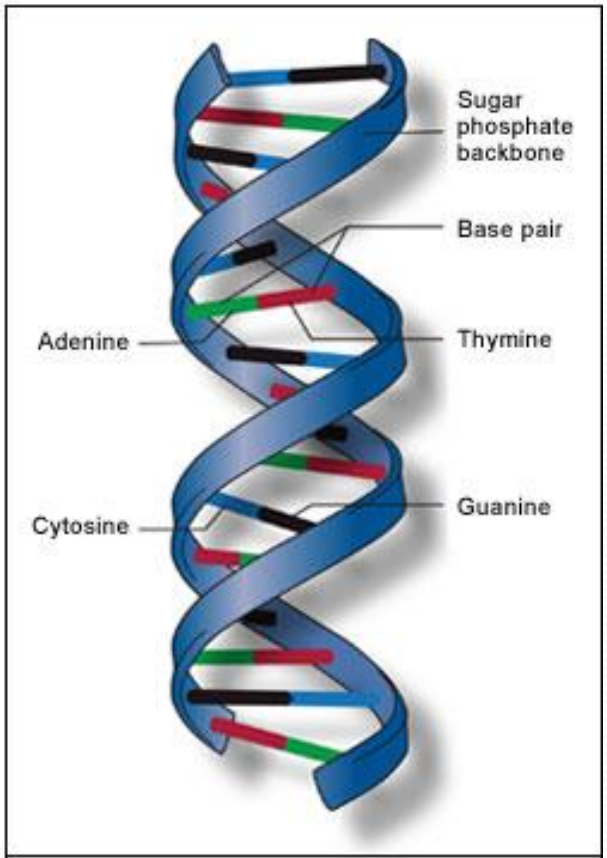
DNA Analysis



DNA double helix

DNA evidence has become an crucial tool in achieving justice for survivors of sexual assault.

1. Increases likelihood of identifying the accused - Analyzing DNA samples allows forensic scientists to compare the profile of the perpetrator against profile (s) of the suspect.
2. Increases likelihood of holding accused accountable - DNA evidence will likely carry weight in court and helps build a stronger case against the accused.

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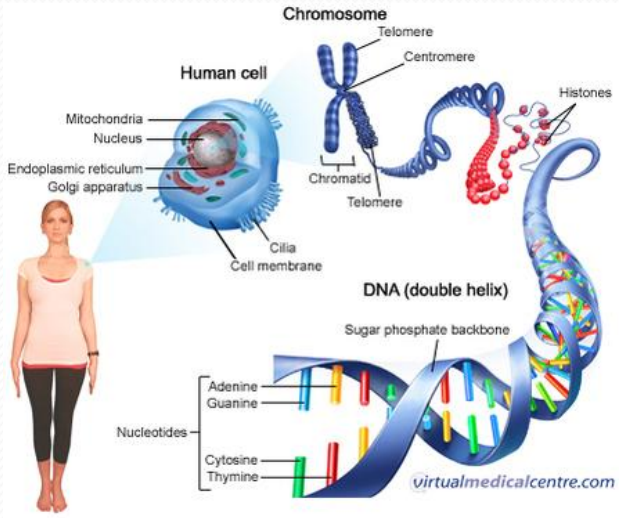
- DNA is the material found in cells that determines characteristics such as eye, hair, and skin color.
- DNA profiles created for evidence contain a certain set of identifiers which are found on the DNA molecule.
- This Information constitutes a DNA profile and is like a fingerprint, the features of DNA profiles can be compared to other DNA profiles for genetic matches or for exclusions.
- The chances of two people having exactly the same DNA profile is 30,000 million to 1 (except for identical twins).
- DNA evidence can be collected from blood, saliva, sweat, urine, skin tissue, semen etc.



- The biological material should be collected for use as evidence as soon as possible due to environmental conditions
- In sexual assault cases, it is important to obtain evidence samples from the victim as soon as possible after the incident, preferably within 12-24 hours and max within 72 hours
- With appropriate storage, DNA evidence collected properly can be analysed after the passage of any amount of time.
- The DNA profiles acquired from the samples collected from the victim's body or crime scene is compared with
    a. Reference Sample i.e the DNA profile of the victim itself to elimination
    b. Suspect's Sample i.e the DNA profile of the suspect

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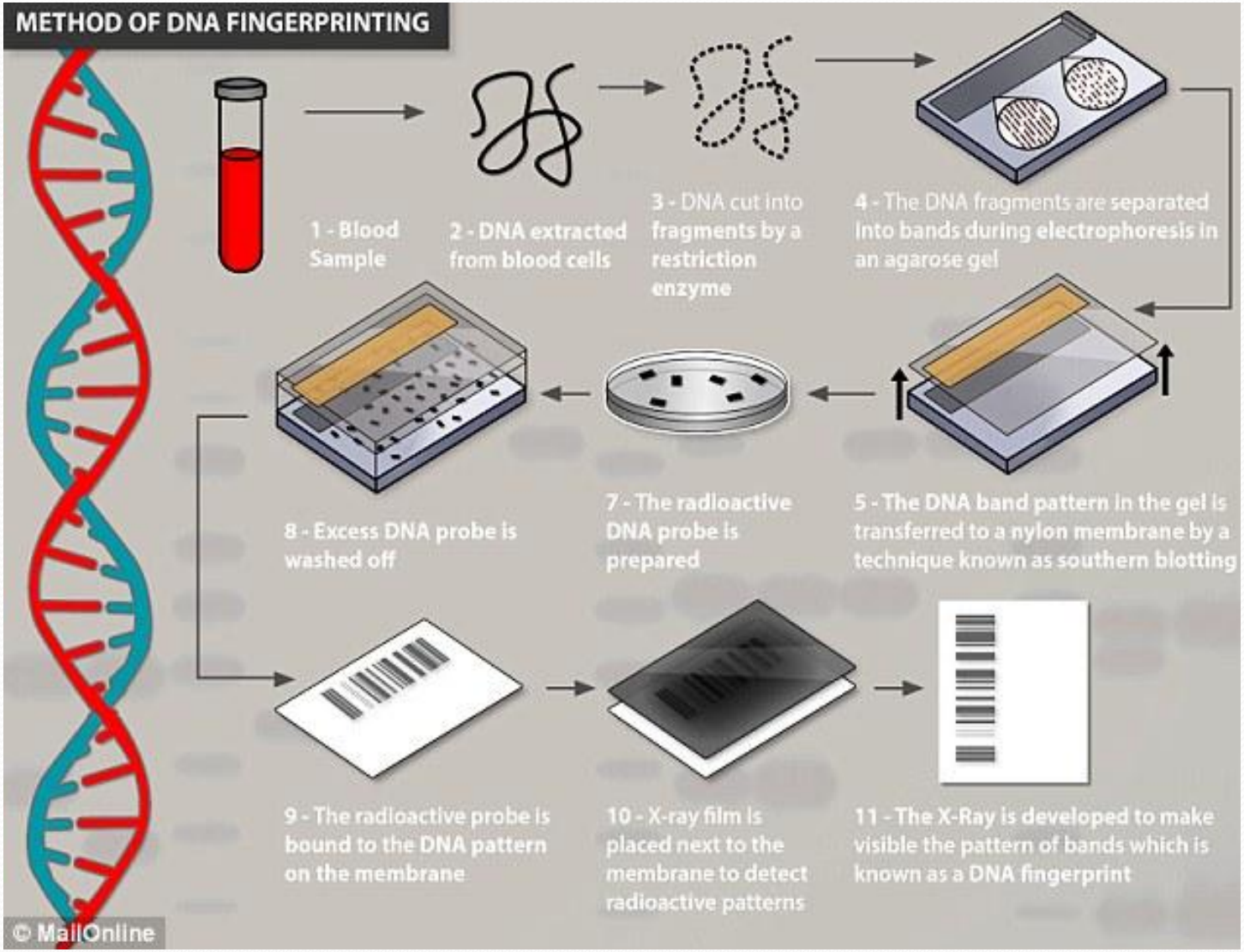


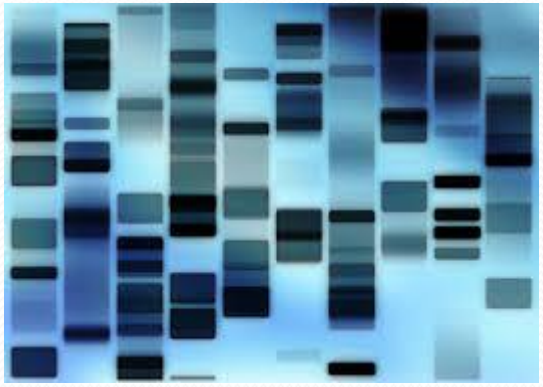
Stage 1: Cells are broken down to release DNA.

Stage 2: The DNA is cut into fragments using restriction enzymes which is known as restriction fragments

Stage 3: Fragments are separated on the basis of size using a process called gel electrophoresis. DNA fragments are injected into wells and an electric current is applied along the gel. DNA is separated on basis of size. A radioactive material is added which combines with the DNA fragments to produce a fluorescent image

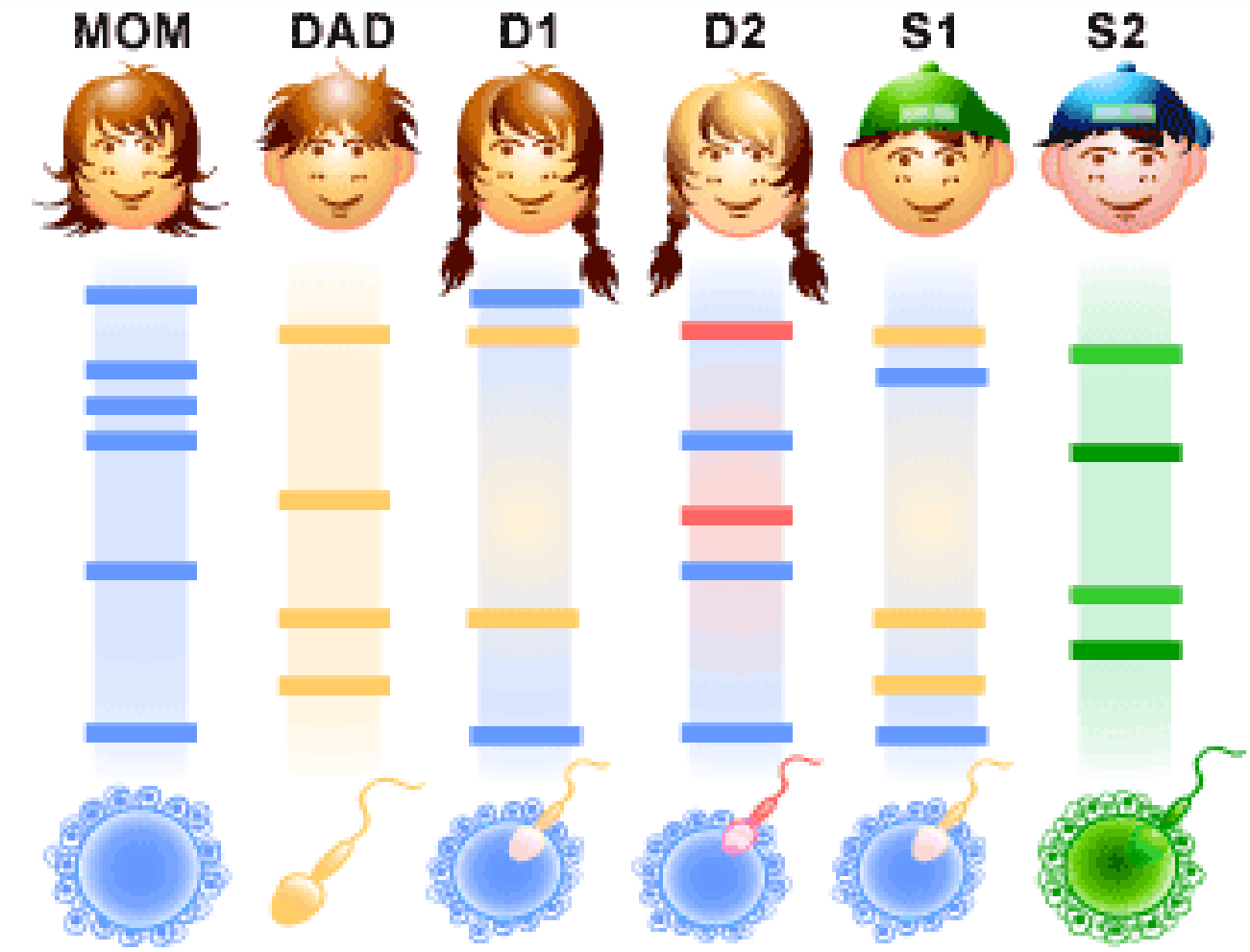
A photographic copy of the DNA bands is obtained.

Stage 4: The pattern of fragment distribution is then analysed.



DNA Pattern

Example



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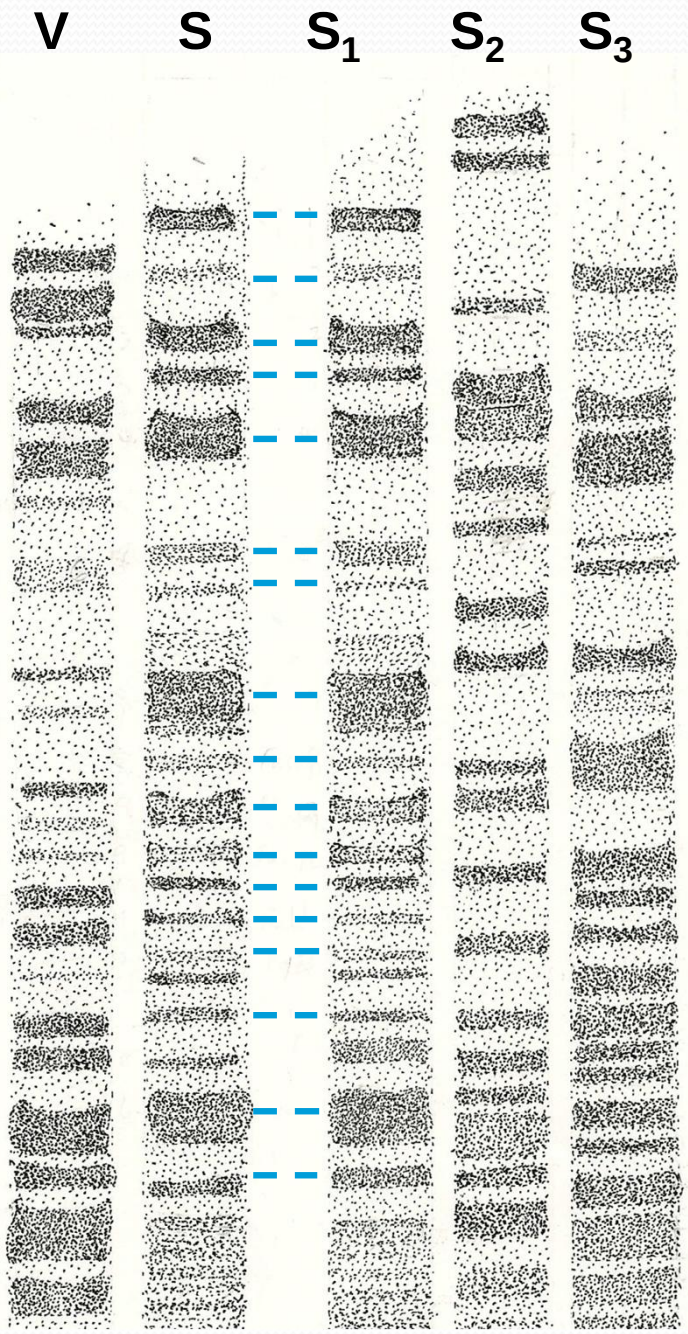

V Victim

S Sample from crime scene

S_1 Suspect 1

S_2 Suspect 2

S_3 Suspect 3

Suspect 1 match those taken from the crime scene

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LET US ALL TOGETHER HELP THE CHILD VICTIMS

THANK YOU

FOR ANY QUERIES

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