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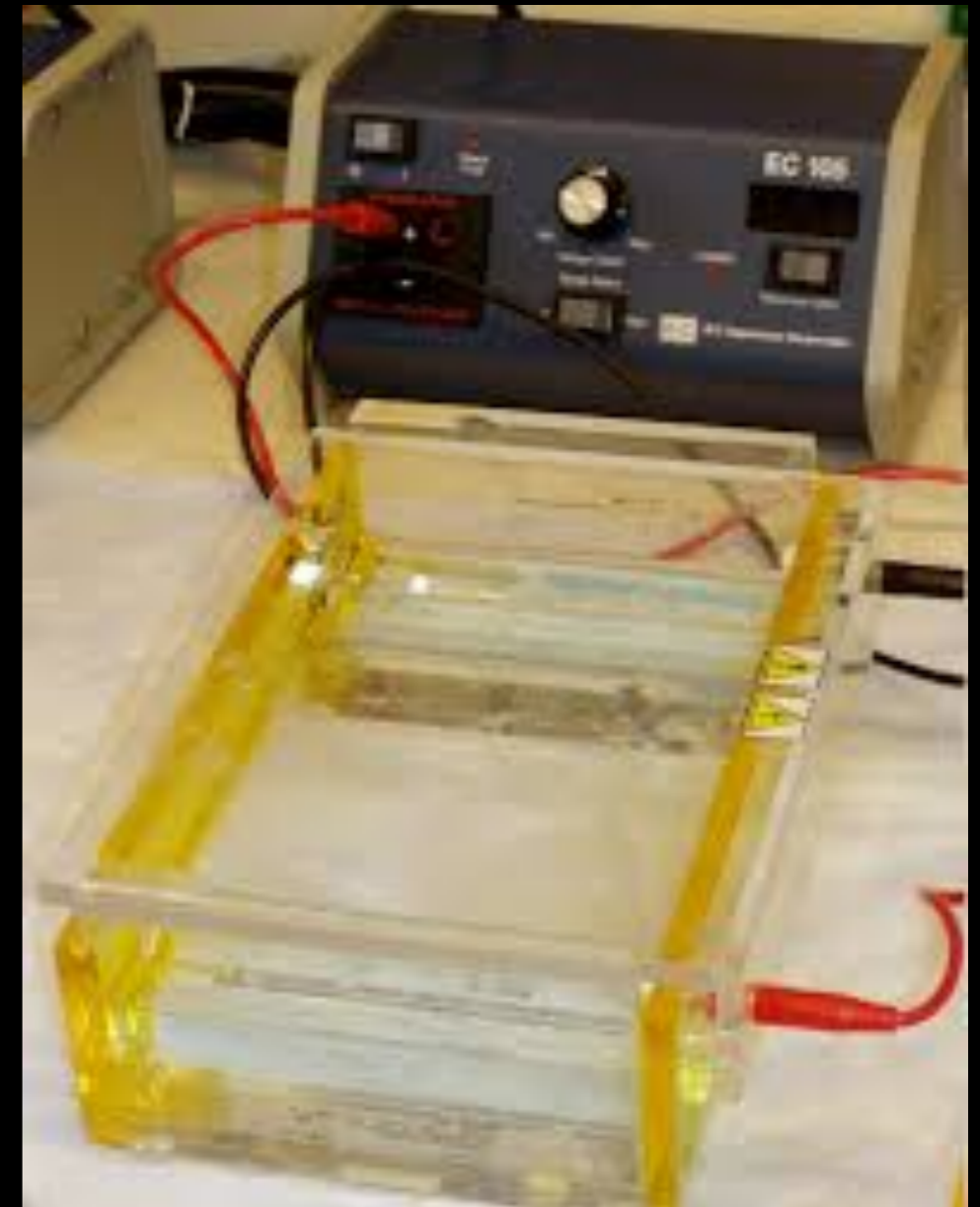
GEL ELECTROPHORESIS



# GEL ELECTROPHORESIS: BASICS



- Technique used to separate charged molecules like DNA, RNA and different proteins accordingly to their size or electrical charge.
- An electrical current is applied across gel which makes one end negative and one end positive. Because DNA is slightly negative, so it travels towards the positive side and the loading dye and DNA leave a pattern in the gel.
- The migration of the molecules leaves a banding pattern which helps determine paternity, genetic diseases, and can be used in crime investigation.



# THE STEPS INVOLVED

- To do a gel electrophoresis analysis, first an agarose gel is made with holes to put the DNA and loading gel in.
- Once the DNA is loaded, the gel has a current run through it to migrate the dye and DNA down the gel.
- What is left is a banding pattern used to determine genetic disease in certain sections and identify the banding pattern of people.
- The different patterns are then compared to make conclusions about the factors tested.



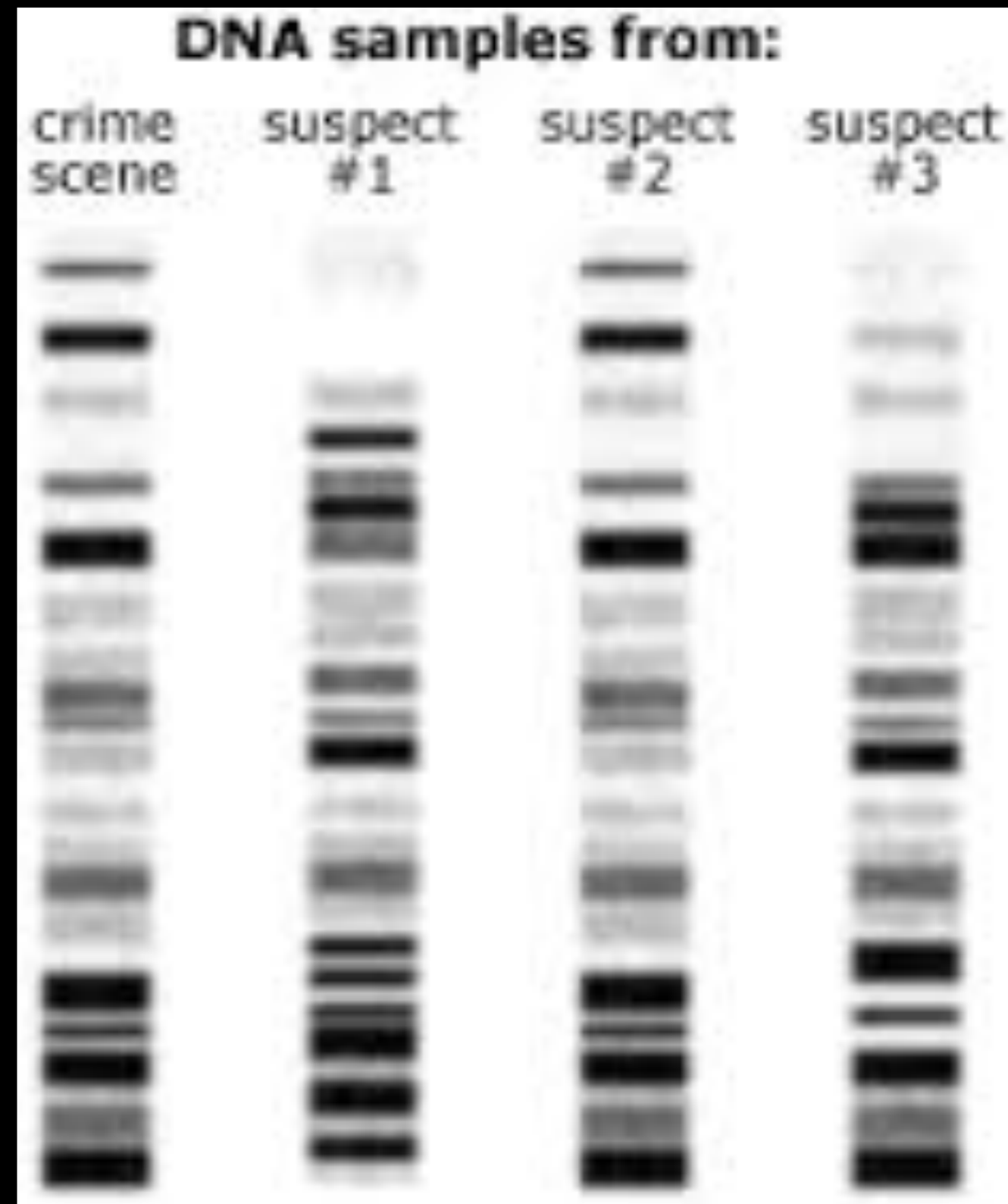
# THE HISTORY



- W. B. Hardy in the turn of the 20th century established that enzymes and other proteins displayed characteristics of electrophoretic mobilities.
- Michaelis used electrophoresis to determine the isoelectric points of various enzymes.
- In the 1940s-50s Klobusitzky and Konig used solid phase electrophoresis, it was then used to characterize a vast array of substances like amino acids.
- The solid state stabilizes the migration of the particles.
- By the mid-1980s agarose was used for solution size dependent molecules to exactly get the desired result.

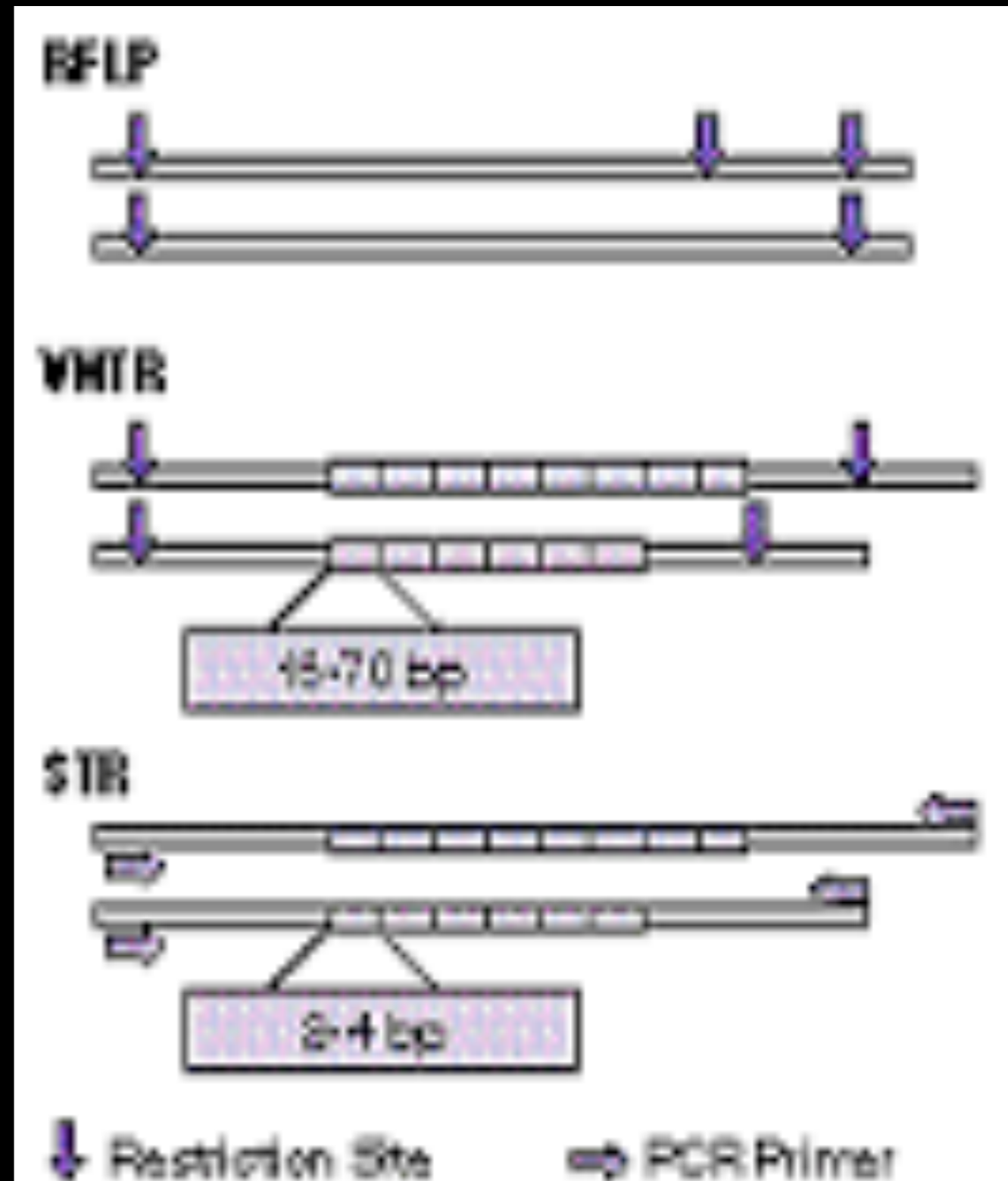
# DNA FINGERPRINTING

- DNA Fingerprinting is an individual's unique collection of DNA Restriction fragments detected by electrophoresis
- The procedure for creating DNA fingerprint extracting and purifying DNA from cells and based on RFLP technology DNA is cut at specific points using proteins (restriction enzymes)



# RFLPS & STRS

- Restriction fragment length polymorphisms are DNA fragments of different lengths created by the activity of restriction enzymes
- Since restriction enzymes cut only certain sequences the result is DNA fragment of a certain length between those sequences
- STR (short tandem repeats) used in DNA profiling are from non coding regions
- Faster than RFLP analysis

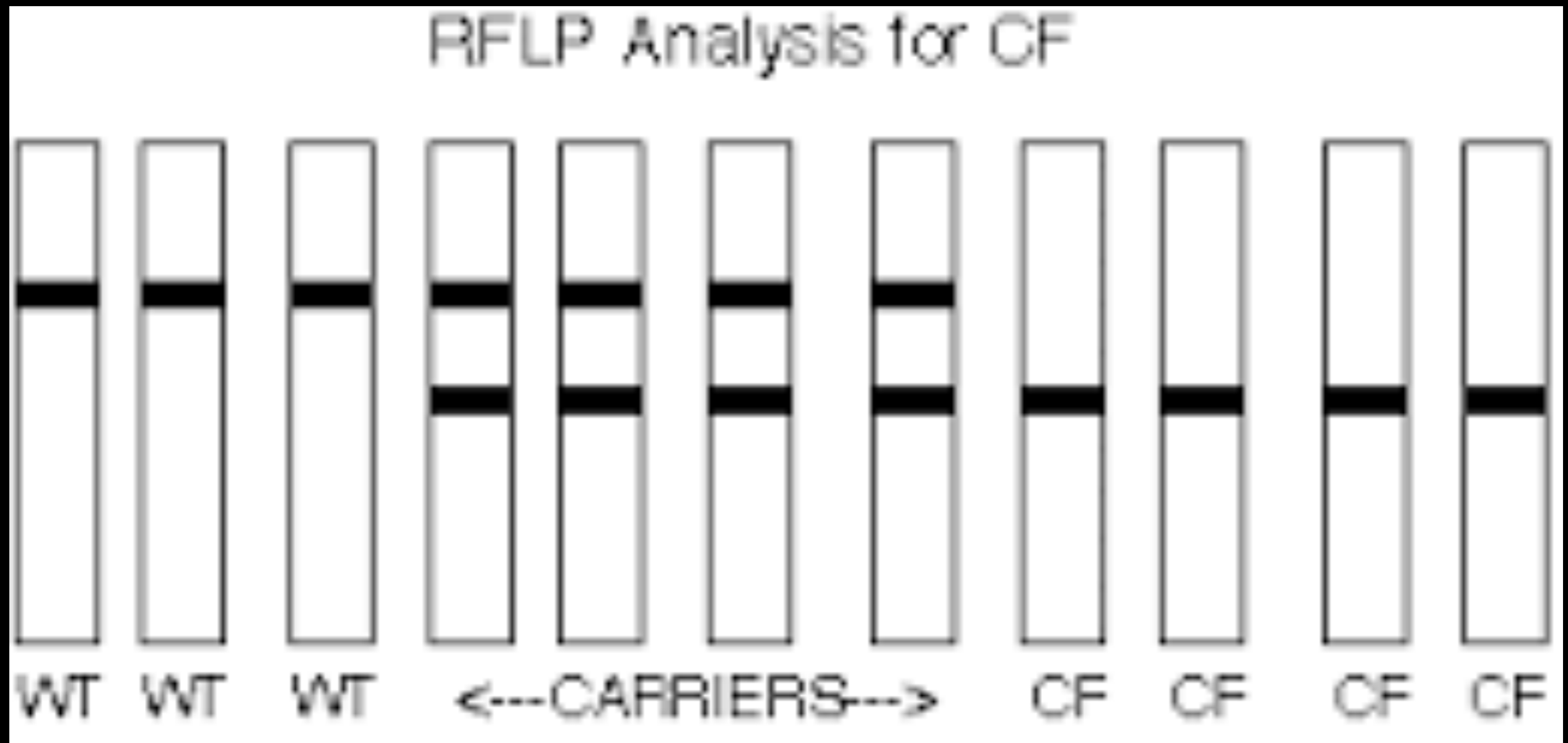


# CURRENT USES

- Gel electrophoresis can be used to determine paternity, the suspects in crime scene investigation, and test for genetic diseases.
- Everyone has a unique banding pattern in some parts of their DNA, so by running gel electrophoresis on the DNA of a potential father can determine if the child is genetically matched.
- DNA found at crime scenes can be run as well and used to find a suspect in the criminal data base with their unique banding pattern.
- Parents can test themselves for certain genetic diseases like Cystic Fibrosis to evaluate the likelihood of their child having that disease.



# GENETIC TESTING FOR CF







# PROS AND CONS

## PROS

- Non expensive
- Reassurance of genetic diseases
- DNA can be tested from any evidence
- Simple to perform

## CONS

- Gel can be altered and provide inaccurate results
- Invasive of personal information
- Limited sample analysis



# WHAT ARE THE ETHICS OF GEL ELECTROPHORESIS?

- Not many ethical concerns of gel electrophoresis, since it is usually used for the good of society such as crime fighting and determination of genetic diseases.
- If parents test their genetics, the results could be devastating to find if their potential children will have genetic diseases. Sometimes the decisions to test are difficult to make.
- The main concern is its use in crime scenes, law enforcement have a great deal of power to be able to test the DNA of potential suspects. Some say this is an invasion of their personal information genetically.



# CASE STUDY-EARL WASHINGTON

- In 1983, Earl Washington falsely confessed of crime he didn't commit and was sentenced to death row.
- He spend 17 years in prison for something he didn't do before a gel electrophoresis analysis proved his innocence.
- In 2001, he was released with the new evidence and modern DNA technology.





SO BECAUSE OF GEL  
ELECTROPHORESIS



YOU CAN KNOW:  
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BABY  
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AND OUR COMPANY WILL USE GEL ELECTROPHORESIS

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