

DNA Profiling, Forensics, and Other Applications

Learning Objectives

1. Be familiar with the older methods of protein fingerprinting, such as human leukocyte antigen, major histocompatibility complex, and red blood cell enzymes, along with their problems.
2. Know the major events in DNA fingerprinting, from Alec Jeffreys' first experiments to the present day.
3. List the applications of DNA fingerprinting.
4. List and define the types of satellite DNA, comparing microsatellites, minisatellites, and macrosatellites in terms of their size and locations in the human genome.
5. Know the difference between tandemly repetitive DNA and interspersed repetitive DNA.
6. Compare the methods and accuracy of multi-locus and single-locus VNTR fingerprinting. What are the advantages and disadvantages of multi-locus and single-locus VNTR fingerprinting methods?
7. Know how the FBI has impacted innovation of DNA fingerprinting through the Combined DNA Index System (CODIS).
8. Describe the method of restriction fragment length polymorphism (RFLP), and know why RFLP is such a powerful technique.
9. List and define the technical considerations that need to be made when samples are collected and analyzed in DNA fingerprinting procedures.
10. Know how and why the polymerase chain reaction (PCR) is important in DNA fingerprinting, as well as the requirements for PCR to be effective in DNA fingerprinting.
11. Know how population genetics applies to forensic analysis.
12. Know the requirements for scientific evidence to be allowed in trials, focusing on the Frye and Daubert standards.
13. Be familiar with how DNA databases are generated, as well as their uses.

14. Be aware of other types of DNA fingerprinting, such as random amplification of polymorphic DNA (RAPD), amplified fragment length polymorphism (AFLP), single-strand conformation polymorphism (SSCP), single nucleotide polymorphism (SNP), mitochondrial DNA, and the Y chromosome.