

An Introduction to Forensic DNA Testing

The goal of this module is to introduce the important role DNA plays in forensic science, forensic DNA laboratory systems and the steps involved in forensic DNA testing using the latest methods and technologies.

Topics

- Forensic DNA Laboratory Systems
- Forensic DNA Applications and Advantages
- Evolution of Forensic DNA Testing
- Federal DNA Legislation
- Forensic STR Analysis Workflow Overview
- Biological Evidence
- Overview of Advanced Forensic DNA Testing Methods

Forensic DNA Laboratory Safety

The goal of this module is to provide students with a thorough understanding of the laboratory safety precautions necessary when handling biological evidence.

Topics

- Osha Bloodborne Pathogen Standard and Requirements
- Infectious Diseases
- Universal Precautions and Personal Protective Equipment
- Cleaning & Sanitizing
- Sharps Injury Prevention
- Contaminated Material Disposal
- General Laboratory Safety

Forensic DNA Testing Quality Assurance

The goal of this module is to provide a strong understanding of the national forensic DNA quality assurance standards and guidelines published by the DNA Advisory Board (DAB) and Scientific Working Group of DNA Analysis Methods (SWGDM).

Topics

- Quality Assurance Overview
- Evolution of Forensic DNA Quality Assurance Standards
- DAB Quality Assurance Standards
- FBI Audit Document
- SWGDAM Guidelines
- Validation
- DNA Analyst Training, Competency, Proficiency and Continuing Education
- Accreditation and Certification
- Laboratory Quality Control Activities

Fundamental Biology and Genetics of Forensic DNA Testing

The goal of this module is to provide a thorough examination of the biological and genetic principles applied in forensic DNA testing. It is important as a forensic DNA analyst to gain an understanding of these concepts, which are relied upon everyday throughout the DNA testing process, as well as in court presentation.

Topics

- Chemical Structure and Properties of DNA
- Human Nuclear Genome
- DNA Replication and Cell Division
- Genes and Protein Synthesis
- Genetic Variation and Mutations
- Genetic Markers, Alleles and Genotypes
- Population Genetics and Power of Discrimination

Basics of RFLP and PCR-Based Forensic DNA Testing Methods

The goal of this module is to provide a historical perspective of the genetic markers and DNA testing methods used in forensic science and introduce the genetic markers and technologies currently used. It is important as a forensic DNA analyst to have an understanding of the evolution of forensic DNA testing in order to appreciate the value of the methods used today.

Topics

- VNTR Genetic Markers
- RFLP Analysis
- Polymerase Chain Reaction (PCR)
- D1S80 Analysis
- Analysis of DQ Alpha and Polymarker Loci
- Current STR Genetic Markers and Kits

Biological Evidence Collection, Screening and Serology

The goal of this module is to provide a thorough understanding of biological evidence detection and collection at crime scenes, laboratory screening to detect the presence of biological stains and serology testing to identify common types of biological evidence.

Topics

- Types of Biological Evidence
- Biological Evidence Detection, Collection and Processing
- Screening for Biological Stains
- Evolution of Forensic Serology
- Serological Analysis Methods and Technologies (blood, semen, saliva)

DNA Extraction for Forensic STR Analysis

The goal of this module is to provide a complete understanding of the physical and chemical processes in extracting DNA from forensic samples. Proper DNA extraction is required for obtaining successful STR analysis results.

Topics

- Purpose of DNA Extraction
- Methods for Casework vs. Databasing
- Preventing Contamination and Degradation
- Theory and Prevention of Inhibition
- Cell Lysis and Protein Digest
- Differential Extractions
- Theory and Protocols for Various Methods of Forensic DNA Extraction
- Robotic Considerations

DNA Quantification for Forensic STR Analysis

The goal of this module is to provide students with a complete understanding of the theory and methods utilized to quantify the amount of DNA recovered during the extraction process. DNA Quantification is another critical step in optimizing the subsequent STR reaction and providing successful STR results

Topics

- Purpose of Quantifying DNA for Casework Samples
- Historical Methods
- Current Methods and Protocols
- Quantifiler and Plexor Kits
- Real Time qPCR
 - Theory
 - Data Analysis
 - Data Interpretation
- Identifying Degradation and Inhibition
- Mixture Interpretation
- Using Quantification Results to Predict Next Step

Forensic STR Amplification

The goal of this module is to provide a thorough understanding of the commercially available forensic STR chemistry kits used in forensic DNA testing today and the polymerase chain reaction (PCR) as it applies specifically to forensic STR amplification.

Topics

- Purpose and Theory of STR Amplification Step
- Forensic STR Amplification Reaction (PCR)
- PCR Optimization and Efficiency
- PCR Artifacts and Challenges
- Commercial Forensic STR Chemistry Kits
 - Development and Design
 - Components
 - Protocols

Capillary Electrophoresis for Forensic STR Analysis

The goal of this module is to provide a thorough understanding of the theory of DNA electrophoresis and detail the components, operations, calibrations, maintenance and troubleshooting of the current capillary electrophoresis instrument platforms.

Topics

- Purpose and Theory of DNA Electrophoresis
- Overview of Gel Electrophoresis
- Applied Biosystems CE Instrument Platforms (310/3100/3130)
 - Hardware Components, Software, Reagents and Consumables
 - General User Workflow
 - Instrument Operations
 - Spatial and Spectral Calibrations
 - Maintenance
 - Troubleshooting

Forensic STR Data Analysis using GeneMapper ID

The purpose of this module is to provide a thorough understanding of how GeneMapper ID Software analyzes forensic STR data to build confidence in your results and expert witness testimony. In addition, you will be able to troubleshoot data analysis issues more effectively and spend less time during data interpretation.

Topics

- Electronic Data
- Characteristics of Raw Data
- Key Functions of GeneMapper ID
- Internal Analysis Workflow and Algorithms
- Characteristics of Analyzed Data
- Introduction to Data Analysis User Workflow

GeneMapper ID Interactive Tutorial

This purpose of this module is to learn how to use GeneMapper ID Software to analyze forensic STR data and become familiar with the software user-interface. Participants will perform each step in the data analysis workflow using guided software simulation.

Forensic STR Data Interpretation, Statistics and Reporting

The goal of this module is to learn how interpret STR data once it has been analyzed to determine genotypes and identify various types of anomalies. In addition, this module focuses on DNA profile comparisons, statistical calculations and the reporting of STR results.

Topics

- STR Data Characteristics
- Extra Peaks
- Peak Height Ratio Imbalances
- Evaluation of Compromised and Mixed Samples
- DNA Profile Comparisons
- Statistical Calculations
- STR Results and Laboratory Reports

Forensic DNA Databases and Courtroom Considerations

The goal of this module is provide a thorough understanding of the forensic DNA databases, federal legislation and caselaw related to forensic DNA testing and various courtroom considerations.

Topics

- Overview of Forensic DNA Databases
- NDIS and CODIS
- State DNA Databases and Legislation
- Database Searches
- Cold Hits
- Statutes of Limitations and John Doe Warrants
- DNA Admissibility
- Court Preparation
- Post-conviction DNA Testing
- Expectations of DNA Evidence: CSI Effect