CHEMISTRY Departmental Seminar

Spring 2017
CHEM 285
Room Duncan Hall 250
1630 - 1745

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Introduction to Massively Parallel DNA Sequencing Technology:
Chemistry and Applications in Forensic Investigations

One of the most significant advances in DNA technology in the last 20 years has been the introduction of Next Generation Sequencing (NGS) or Massively Parallel Sequencing (MPS). Advances have provided low cost, large volume, rapid, accurate sequencing capabilities that have been applied to various questions in several diverse scientific fields including human disease genomics, cancer, infectious disease diagnostics, microbiology, epidemiology, evolutionary biology, plant genomics population and comparative genomics, meta genomics and forensic DNA. Massively parallel sequencing (MPS) systems enable simultaneous analysis of forensically relevant genetic markers to improve efficiency, capacity, and resolution, and provides a dramatic improvement in the capabilities of forensic DNA laboratories to solve crimes. MPS provides the ability to generate results on nearly 10 fold more genetic loci than current technology.

In cases where the evidence is limiting and multiple tests are indicated, the ability to multiplex molecular tests (autosomal STRs and YSTRs) into one test reduces consumption of evidence and total assay time. The ability to perform sample-specific indexing/barcoding permits multiplexing of up to 96 samples per analysis using 1 ng or less of template DNA. The ability to detect sequence variants of STR alleles of the same size (isometric heterozygotes) not detected by CE provides higher discrimination, increased mixture resolution and more accurate results. In addition enhanced results can be obtained on degraded and inhibited samples as many MPS loci target small amplicons (<200 bp). The compatibility of the STR data with worldwide CODIS DNA databases facilitates the use of already established databases and the ability to investigate familial relationships and personal identification using X and Y STRs without iterative testing. Finally, this technology permits the development of investigative leads using SNPs for phenotype and ancestry prediction in cases with no observed database hits. The ability to sequence multiple forensic type samples for multiple genetic markers from minute amounts of DNA, provides a method for higher genetic resolution and efficiency to solve more cases. This seminar will cover 1) History and definitions 2) Advantages 3) Basics of MPS Chemistry 4) Some MPS performance data and 5) Summary.

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