

INTERNSHIP REPORT

Name- Sagar Tapase

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Topic: “The Future of Genetic Testing: Next Generation Sequencing (NGS)”

Introduction

Next-generation sequencing (NGS) is a cutting-edge technology that offers high throughput, scalability, and speed, enabling detailed analysis of whole genomes or specific DNA/RNA regions. It has revolutionized biological research, providing unprecedented insights. Genetic testing, which began with the discovery of DNA's structure in the 1950s, has evolved through methods like karyotyping and PCR, impacting medicine and biology by diagnosing inherited disorders. However, traditional genetic testing methods like Sanger sequencing are labor-intensive, expensive, and limited in scope. Introduced in the mid-2000s, NGS has transformed genetic testing by allowing the simultaneous sequencing of millions of DNA fragments, increasing throughput, and reducing costs. NGS enables comprehensive genome analysis, advancing personalized medicine and cancer genomics. It is transforming healthcare by enabling early detection of genetic disorders, identifying mutations for targeted therapies, and tailoring treatments based on individual genetics, making it a cornerstone of future healthcare and research.

Objective of Internship

This study aims to evaluate the capabilities and limitations of next-generation sequencing (NGS) compared to traditional genetic testing methods, explore its potential applications in healthcare (such as cancer diagnosis and carrier screening), investigate the ethical considerations surrounding its use (including informed consent and data privacy), and assess its potential economic impact on healthcare systems.

Organizational Profile

JML (Jaipur Molecular Lab) is a top-tier genetic laboratory specializing in Next-Generation Sequencing (NGS). With advanced technology and expert staff, we offer precise genetic analysis for personalized healthcare, driving advancements in genetic medicine and patient care. Trust JML for accurate and timely NGS services.

Key Activities/Projects Undertaken Other than Dissertation

- **Genetic Data Analysis Project:** Analyzed large-scale genetic datasets using bioinformatics tools to identify disease-associated variants.

- **Clinical Genomics Internship:** Assisted in sequencing and interpreting patient samples for diagnostic purposes.
- **Bioinformatics Workshop:** Participated in and contributed to workshops on NGS data analysis and interpretation.
- **Cancer Research Study:** Collaborated on a research project focusing on identifying genetic mutations in tumor samples using NGS.

Key Learnings from Internship

- **Enhanced Capabilities of NGS:** NGS offers higher throughput, broader application range, and increased sensitivity and specificity compared to traditional genetic testing methods.
- **Broad Healthcare Applications:** NGS has significant potential in various areas of healthcare, including cancer diagnosis, carrier screening, and personalized medicine.
- **Ethical Considerations:** The use of NGS in genetic testing raises important ethical issues, such as the need for comprehensive informed consent and robust data privacy protections.
- **Economic Impact:** NGS can potentially reduce healthcare costs through early and accurate diagnosis, although significant investment in infrastructure and skilled personnel is required.