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Editorial

Genomics and Molecular Services in Developing Economies: a Suggested Road Map to Incorporate Technology in Parallel to the Emerging Landscape of Genetic Service

Provision AI AI-Driven Arena

INTRODUCTION

1. Science has never stayed static but has been evolving, revolutionizing, and opening out in

360 degrees. From the prehistoric invention of the wheel to the development of the "James Webb Telescope," it was all hard work, allowing headway towards the envisioned redefinition of scientific discovery, which has led to the current day scientific boom. What we learn over time is that 'change' is the only constant in any human development and discovery. Recent landmark innovations of biotechnology and ambitious exploration of the human genome have allowed mining of the intricate 'cellular life' to enlighten our species with DNA and RNA world illuminating us with a tsunami of newer diagnostics and possibly therapeutics.[1] Molecular sciences and genomics over recent decades to replace the conventional in clinical science with the potential to emerge as definitive medical tools for diagnostics. It can be an easy deduction to foresee that the genomics era has ushered in fast with more robustness to muscle much-needed depth now needed in clinical diagnostic care.[2] The swarming growth of diagnostic markers has steadily entered the clinical corridors, necessitating a nationwide need for 'standard of care in Molecular Pathology.[3]

2. Despite the aforementioned points, the genomics market has advanced significantly to investigate molecular defects with enhanced precision. This improved accuracy benefits diagnostics and potentially extends to CRISPR-based diagnostics, bringing them closer to the gold standard.[4] This contemporary tide in healthcare market is much paced up to replace pathology with the incoming entry of newer nano diagnostic and therapeutic markets as Artificial intelligence (AI), 3-D organoid models, CRISPR genome editing technologies, genetically defined foods and organisms and various other sensational changes in mankind's plight in coming era to allow us few inches further towards aiming the nascent emergence of molecular pathology.[5] Alongside the fueling role of mitogenetics and epigenomics modifying scars from the environmental triggers, an obligation to endorse the redefining trends in absorbing the superlative medical technologies.

Taking an example from one of the legends, Steve Jobs, "Innovation distinguishes between a leader and a follower." The healthcare sector faces unprecedented innovation at a pace and scale that could strain a struggling economy. Despite this, our clinical markets— both industry and clinics—must diligently strive to close this widening gap. This necessitates focused effort, accurate assessments, and a willingness to adapt strategies to current trends.

3. Every achievement starts as an idea, nurtured by belief and fueled by persistence. x.Molecular sciences and genomics have recently enabled significant progress in understanding the human genome, from decoding genomic transcription and translation to identifying subtle pathological elements in living organisms through data mining. In the developing world, these knowledge disparities highlight a growing "renaissance" that is expanding the knowledge gap, particularly in molecular sciences.[5] To achieve desirable medical innovations, we must connect a large catchment area, fostering subject matter expertise that will ultimately enable real-time translation.

4. In the recent past, after the "Watson and Crick" discovery of the double helical model of DNA, we were led to PCR techniques almost five decades ago. The first of its kind, the Human Genome Sequencing project emerged as a watershed movement, which allowed nano insight into the diversified world of the genome. Follow-up to these landmark developments included the recognition of the new sciences of molecular pathology, genomics, mitogenetics, epigenomics, and so on, with each hour further supplanting the methodologies. Overtime we the scientific worked deepened enough to allow molecular scientists to next-level genomics practice to incorporate genome editing technologies like "Clustered Regularly Interspaced Short Palindromic Repeats" (CRISPR) with Cas and alike proteins finally allowing edit in genome with clinical solutions for defective gene.[5,6] The maturity overtime was witnessed with generational growth in the technology from CRISPR-1 to CRISPR-5 followed by base editing and prime editing. Alongside 3-D organoid culturing systems, bio-banking, gene bank, 3-D organoid models, advancements in fertility care, incoming

projects like telomere repairing to achieve senescence, and multiple small RNAs (miRNA, piwiRNA, and others) were worked up for right-sizing genome defects. These technologies may only be representing the icing on the cake. A lot more in multidimensional workup is being innovated by the hour for improving and generating improvements.

5. This persuasive editorial remains an intent to create awareness and sensitization in medical policy makers and healthcare business owners, and local researchers to amplify their efforts to usher in the genomics economy to self-sustain the Pakistani economy at least in this new dimension. The following specific steps are suggested:

Pakistani-branded development of amplification techniques,

CRISPR diagnostics and therapeutics,

Local market of molecular pathology testing,

Different sequencing technologies from DNA to epigenetics, d-Mastering and adding various sequencing services to include DNA, RNA, epigenomes, and other types,

Training service-specific human resources,

AI infusion in workflows wherever applicable, especially bio-informatics and rightsizing CRISPR/Cas genome targeting,

Cost-effective service to reduce dead volume via inventory management in house quality certified primer production lab for own use and sale, and

Facilitating "patient-pathologist-clinician" inter-action models by of "Genomic

Counseling" services within the lab.[7]

Adopting a "kick-start" approach is crucial now to establish molecular pathology in the SouthEastern region. Failure to do so will result in losing the local economic benefits and hinder opportunities to attract international clients.

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