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POLYOMICS- PIVOTAL ROLE IN DRUG DEVELOPMENT

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ABSTRACT

The rapid development in basic sciences and biotechnological revolutions has completely changed the oppurtunities and concepts for treatment. However, the upgradation in research and developmental science has not been equalled by the same level of progress in understanding the clinical basis of various diseases and the development of treatment. This gap can be overcome by applying polyomics in translational research throughout the drug discovery and development. This review describes the role of polyomics in drug discovery and development.

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INTRODUCTION

Drug discovery is a tedious process with high cost (800 million dollars); more time consuming (10-15 years) to bring drug from concept to clinic. Most of the drug candidates fail in early drug development; it should have primary and overarching focus on the plans and options that proceed with minimum investment, based on an active reduction in the uncertainty around i.e. pharmacology, pharmacokinetics - pharmacodynamic properties, safety and so on. [1] A need exists to translate more quickly the numerous discoveries into more effective application relevant to human health and disease. [2] One such key initiation is to strengthen Translational Research. Traslational Research is defined as the movement of discoveries in basic research [the bench] to application at clinical level [the bedside]. [3] Translational research is a different pathway emerged in investigative medicine. [4] There are several advanced technologies that assist Translational Research.

Polyomics is one such advancement that assists Traslational Research and is defined as the integration mining of information-rich datasets with development and use of novel therapeutic agents [2]. Datasets are obtained through analysis of preclinical and clinical specimens using technologies with the aim of improving discovery. There is opportunity to pool the generation of biomedical data since last decade due to development of platform technologies. Polyomics include Genomics, Transcriptomics, Peptidomics, Proteomics and Metabonomics. Through the application of such polyomics in drug development, it will play a more pivotal role, because many more drug candidates will be generated in the years ahead compared with the present. The impact of Polyomics in pharmaceutical drug development can be cosidered at three levels:

1. Increased understanding of disease etiology, target identification and validation;
2. Improved descision making during the development process and
3. The identification of diagnostic tests to improve prescribing precision by identifying subjects likely to have a poor response or an adverse event before starting therapy.

The application of the above technologies generates large quantities of biological data, which will alter as a result of the disease state, severity and pharmacological interventions. These tools can be used to detect specific changes that predict disease prognosis and drug response.However, each technology examines different components of the biological system under study, such as

Genomics: is the study of all the genes in a person, as well as the interactions of those genes with each other and a person's physical and social environment. It uses population data on genetic variation and gene-environment interactions to develop evidence-based tools for improving health and preventing disease. [5]

Transcriptomics: A transcriptome is a collection of all Messenger RNA molecules in a population of cells. Along with DNA, these RNA molecules help create proteins. Transcriptomics provides tools that help researchers gain a better understanding of how genes and pathways are involved in biological processes. [6]

Peptidomics: is the systematic, comprehensive, qualitative and quantitative multiplex (e.g. mass spectrometry) analysis of endogenous peptides in a biological sample. [7]

Proteomics: is the large-scale study of proteins, particularly their structures and functions. [8]

Metabonomics: is a systems approach for studying in vivo metabolic profiles, which promises to provide information on drug toxicity, disease processes and gene function at several stages in the discovery and development process. [9]

As a result, it is widely expected that integration of the information derived from all the technologies will produce a synergistic increase over the sum of their individual value. But, this integration requires appropriate biomedical, informatics, data management, statistical and mathematical resource.

Hence, Polyomics in Translational research can enhance many aspects of pharmaceutical business, such as the efficient use of predictive technology and new technique could ensure the timely removal of poor compounds and facilitate the identification and acceleration of good compounds that will fulfill a medical need.

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