

Role of Pharmacogenomics in Drug Designing

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Pharmacogenomics is the study that examines how genetic variations affect the ways in which individual respond to drugs which are complex traits that are influenced by many different genes. It intends to develop rational means of optimizing drug therapy, with respect to the individuals' genotype, to maximize efficacy with minimal adverse drug reactions. Indeed, pharmacogenomics is exploited as an essential step for target discovery and drug development in the pharmaceutical industry. Advances in genomics technology and high throughput platform over the past several years have transformed drug discovery. Further, applications of functional genomics have revolutionized drug discovery approach. Functional genomics, therefore, is not simply a process toward novel drug discovery, but a general approach to assigning biological functions to genes with currently unknown roles in all organisms. A traditional drug discovery approach begins with a pathophysiological or physiological process which is typically a long and labour intensive process while in functional genomics,

the genome is explored to understand which genes or proteins may participate in the disease. This approach does not require a priori understanding of the molecular pathways causing the disease; in fact, the power of functional genomics is revealing roles of previously unsuspected pathways. Pharmacogenomics uses genome wide approaches to elucidate the inherited basis of differences between individuals in the response to drugs. The genetic variations involved are often alleles of genes involved in drug metabolism. The Cytochrome p450 gene super-family provides good examples. Findings from the Human Genome Project and subsequent availability of millions of single nucleotide polymorphisms have helped in application of genomics technology in determining the interplay of several gene/gene products that influence the pharmacokinetics and pharmacodynamics of medications, including inherited differences in drug targets and drug disposition, polygenic determinants of drug effects that have become increasingly important in pharmacogenomics. Further refinement and high throughput genotyping methods would soon help develop simple test for several single nucleotide polymorphisms in one assay. Pharmacogenomics holds considerable promise for drug discovery and development. Although transcriptomic and proteomic studies are evolving strategies for identifying genes that may influence drug response, but there are many challenges for pharmacogenomics approaches with major limitations is the incompleteness of knowledge of pharmacokinetics and mechanisms of action of any particular medication.