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Pharmacogenomics and Its Importance

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Pharmacogenomics is the study of genome role in the response of drugs. The name Pharmacogenomics (pharmaco+genomics) reflects the combination of pharmacology and genomics. Pharmacogenomics analyses the genetic makeup of individual effects and their responses to drugs. Pharmacogenomics deals with the influence of inherited and acquired genetic variation on drug response in individuals by correlating with the gene expression or SNPs (Single-nucleotide Polymorphisms) with pharmacokinetics (drug absorption, distribution, metabolism, and elimination) and pharmacodynamics (drug's biological targets) [1]. The term pharmacogenomics is often used with pharmacogenetics. Both the terms are inter-related to the drug response based on the genetic influences, pharmacogenetics focuses on single drug-gene interactions, while pharmacogenomics incorporates genome-wide association approach, genomics, and epigenetics however dealing with the multiple genes effects on the drug response [2].

Pharmacogenomics targets to advance the coherent to optimize the drug therapy, with respect to the individual's genotype, to make sure maximum efficacy with minimal adversarial effects. By utilizing pharmacogenomics, it is hoped that pharmaceutical drug therapy can deviate from the approach "one-dose-fits-all". Pharmacogenomics also efforts to eliminate the trial-and-error method of advising, permitting physicians to take into their consideration of individual genes, the functionality of genes, and their effect on the efficacy of the patient's current or future therapies (applicable, and provide an explanation for the failure of previous therapies) [3]. These kind of approaches assurances the advent of precision medicine and personalized medicine, in which the drugs and their combinations of drugs are optimized for slight subsets of each individual's unique genetic makeup. Whether it is used to explain the individual's response or it is a lack of treatment or acts as a predictive tool, it hopes to achieve much better treatment outcomes with the greater efficacy, minimization of the occurrence of drug toxicities and adverse drug reactions (ADRs) [4]. For individuals who have a lack therapeutic response, alternative therapies can be prescribed which suit best to their requirements. In order to give recommendations for a pharmacogenomics drug given, two types of possible input can be used: genotyping or exome or whole-genome sequencing. Sequencing provides many more data, includes detection of mutations that prematurely terminate the synthesized protein (early stop codon) [5].

Drug-metabolizing Enzymes

There are many known genes which are responsible for variances in the metabolism of drug and its responses. The focus on the genes that are widely accepted and utilized clinically for brevity.

- Cytochrome P450s
- VKORC1
- TPMT

Applications of pharmacogenomics

Few commonly known applications of pharmacogenomics are as follows

- Improves drug safety, and reduce Adverse Drug Reactions (ADRs)
- Tailors the treatment to meet individual's unique genetic predisposition, and identifies optimal dose
- Improves drug discovery which is targeted to human diseases
- Improves proof of principle for trials.

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