

EDITORIAL

Cancer communications for the development of personalized medicine

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Introduction

Keeping in view the need for corporate communications in cancer research perspective, which means communications serves as the liaison between an organization and public. This editorial presents a view which is very different from commercial-marketing a product or liaisoning with producer companies etc. It is all about developments in cancer research which leads one to understand - what is personalized medicine. As the scientific and medical communities begin to decipher the secrets locked in the human genome code, the way we approach the diagnosis, treatment and prevention of disease will change dramatically. With the detection of human genome, scientists have already created large databases filled with thousands of single nucleotide sequence changes. Some of these single nucleotide polymorphisms (SNPs) could define the genetic basis of what keeps healthy or makes us sick. Currently the most common applications for SNP related research tools are gene-disease association studies, drug-gene interactions and drug target validation. Other popular applications are disease susceptibility studies or diagnostics, pharmacogenomic studies for clinical trials, drug target screening, and new technology development.

The revolution in cancer research can be summed up in a single sentence: Cancer is, in essence, a genetic disease involving more than 350 signature genes distributed over several chromosomes. There is now evidence that alterations in three types of genes are responsible for tumorigenesis: oncogenes, tumor-suppressor genes and stability genes. Unlike diseases like sickle cell anemia, cystic fibrosis or muscular dystrophy, wherein mutations in one gene can cause the disease, no single gene defect 'causes' cancer. Human cells have multiple safeguards to protect them against the potentially lethal effects of cancer gene mutations, and only when several genes become defective then an invasive cancer develops, this phenomenon explains the functional network of cancer metagenes. Thus it is best to think of mutated genes as contributing, rather than causing, cancer.

Research, genetic differences affecting patient's treatment response

Our work involves an ongoing quest to identify genomic factors that control drug response in individuals and populations; the bibliographic list below shows our contributions in this area for the last seven years. Clinical observations of inherited differences in drug effects were first documented in the 1950s, giving rise to the field of Pharmacogenomics. The figure below is an excellent example of distribution of phenotypes with respect to the various effects of one drug given to a group of patients diagnosed with similar clinical symptoms.

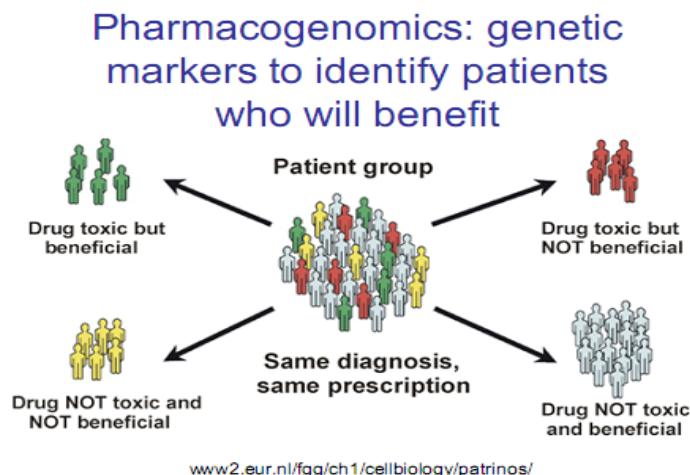


Figure 1. Distribution of phenotypes with respect to the various effects of one drug given to a group of patients diagnosed with similar clinical symptoms

Pharmacogenomics is a rapidly growing field that aims to elucidate the genetic basis for inter-individual differences in drug response and to use such genetic information to predict the safety, toxicity and/or efficacy of drugs in individual patients or groups of patients. While drug-gene interactions and environmental factors significantly contribute to inter-individual variability in drug response, genetic factors also appear to have a major impact on drug response and disposition. Considering the significant heterogeneity associated with patient responses to chemotherapeutic agents and their narrow therapeutic indices, pharmacogenomics has the potential to offer individualized cancer treatment regimens. Although many non-genetic factors influence the effects of medications, including age, environmental factors, habits, organ function, concomitant therapy, drug interactions (as shown in the diagram below) and the nature of the disease, there are now numerous examples of cases in which inter-individual differences in drug response are due to sequence variants in genes encoding drug-metabolizing enzymes, drug transporters, or drug targets. Such studies can be translated to clinical practice via molecular diagnostics (genotyping) in order to guide selection of the optimal drug combination and dosage for the individual patient.

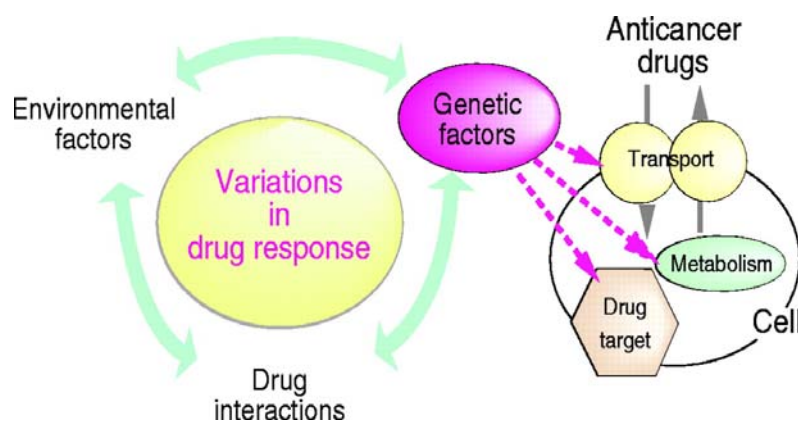


Figure 2. Multiple factors contributing to variations in drug responses

Theory and practice (Pharma market trends)

The recent trends in Pharmacogenomics will begin to increase steadily and could quickly become a multibillion-dollar market itself. Every year as many as 100,000 patients in hospitals die as the result of adverse drug reactions. How many of those deaths could be avoided if we knew in advance which drugs were safe and which weren't for those particular

patients? And beyond those dire cases, how much more effectively could we treat sick people if we knew what variants in their genomes made certain drugs more effective than others for them? The rapidly developing field of Pharmacogenomics aims to examine the genomes (DNA) of patients and use that information to prescribe the right drugs at the right dose. The knowledge of the expression of genes is critical to the action of the cancer drugs that can be used to individualize therapy.

In every cancer diagnosis, communication plays a key role in helping patients and physicians make the best decisions about treatment options, risks, and benefits. And those who live beyond cancer are more likely to experience a better quality of life when they have access to useful information and support in dealing with post-treatment effects. Culturally and linguistically appropriate communication helps people make decisions that are compatible with people's values and beliefs. The goal of communications in cancer research is to first Understand, Apply, and Disseminate effective communication approaches that maximize access for appropriate use of cancer information by all those who need it.

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