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Editorial

Heterogeneous Cancer Warrants a Personalized Vaccine

Shikha Mohan and Damodar Gupta*

Department of Capacity Enhancement and Product Induction, Institute of Nuclear Medicine and Allied Sciences, Defence Research and Development Organization, Timarpur, Delhi, India

***Corresponding Author:** Damodar Gupta, Department of Capacity Enhancement and Product Induction, Institute of Nuclear Medicine and Allied Sciences, Defence Research and Development Organization, Timarpur, Delhi, India.

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The complex and dynamic nature of Cancer is mainly attributed to its heterogeneous character [1-4]. This heterogeneity can be in the form of clonal or intra-tumor diversity where in a solid primary tumor may comprise of subpopulation of cells with genomic variations. Additionally, metastatic cancer cells may also be genetically and phenotypically distinct from its primary tumor cells. The inter-tumor variation is observed when tumor cells of same histopathologic origin display genomic diversity, further contributing to the complexity of cancer. This heterogeneity makes development of standardized treatment regime impractical and poor prognosis. These genetic diversities arise due to the new mutations acquired by a progenitor cancer cell resulting in clones and further subclones displaying accelerated growth capacity leading to spatial and temporal heterogeneity. The clinical intervention results in the Darwinian selection of drug resistant variants which further divides incorporating mutations and re-establishing heterogeneity. Thus, carcinogenesis is an evolutionary process that involves selection of genetic mutations that promote rapid turnover and drug resistant phenotypes culminating in inferior clinical outcomes.

Personalized cancer medicine aims to provide customized treatment tailored according to the individual patient genetic makeup as well as cancer genetics [5]. The field of precision or personalized medicine has gained momentum due to substantial growth in characterization of human genome, epigenome, proteome and metabolome as well as advent of science of pharmacogenomics. Pharmacogenomics involves the studying effects of genetic makeup of an individual on their response to drugs. Such information is vital as difference in response to a particular treatment in different individual may be due to genetic variations in genes responsible for metabolizing drugs. Additionally, advancement in early markers (biochemical, epigenetic, genetic, transcriptomics, metabolomic or proteomic) detection and their multiplexing helps in accurately detection and staging cancer as well as designing preventive or therapeutic regime specific to a particular individual. Due to changing cancer biology, repeated biopsies of drug-tolerant tumor cells or metastatic cancer cell will also be required for design personalized anti-cancer therapies [6].

Providing personalized cancer care is still a emerging field as all possible genetic variations contributing to differential drug responses, formation of primary tumour of different origin and their growth, conferring drug resistant trait to cancer cells or promotion of secondary tumor formation is under progress. The compilation of such data from genomic studies along with those obtained from other 'Omics' science globally in form of freely available and annotated databases should be sought. This sharing of data shall help researchers to attribute molecular signatures to cancer according to their tissue of origin as well as stage and pave the way for further refining of diagnostic or prognostic tests. Information from such database shall also promote recognition of new drug targets and strategies to overcome drug resistance in a patient with a specific set of mutation. The success of personalized medicine shall also require up-skilling of healthcare providers to comprehend complex molecular profile of patient and accordingly plan most effective treatment strategy for each patient.

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