Editorial

Precision Medicine in Hematopathology

As President Obama mentioned for The Precision Medicine Initiative in 2015 [1] , "Doctors have always recognized that every patient is unique, and doctors have always tried to tailor their treatments as best as they can to individuals". "What if matching a cancer cure to our genetic codes was just as easy, just as standard? What if figuring the right dose of medicine was just as simple as taking our temperature?" Therefore, Precision Medicine can be defined as *Health care tailored to each individual*.

Precision Medicine generally includes two major aspects: 1) specific treatment of diseases based on the defined therapeutic targets; 2) tailored management of patients according to the individual's genetic and metabolic makeups [2]. Precision Medicine is particularly relevant to Hematopathology for the following reasons: 1) hematological malignancies are systemic diseases, often requiring systemic treatment; 2) most of the current standard therapies (Chemo/Radiotherapy) have serious adverse effects; 3) both hematological therapeutic targets and patients' genetic and metabolic makeups are provided by hematopathologists with the help of cytogeneticists and molecular pathologists.

The first classical example of *targeted therapy* is to use Vitamin A to treat acute promyelocytic leukemia (APL) [3]. Since then, hematopathologists have been providing the evidence of retinoic acid receptor rearrangements for the clinicians to treat patients with APL. Hematopathologists routinely provide the evidence of CD20 expression for B-cell lymphomas to be treated with rituximab, a humanized monoclonal antibody [4]. They also routinely provide the tyrosine kinase *ABL1* rearrangement for treating chronic myeloid leukemia (CML) which is specifically targeted by the small molecule imatinib [5]. Nowadays we have hundreds of targeted therapeutic agents that are either already in clinical use or are still in clinical trials.

The second aspect of Precision Medicine is *pharmacomics*, short for pharmacogenomics, pharmacoproteomics and pharmacometabolomics, etc. Hematological malignancies are currently treated based on the pathological diagnosis and population-based clinical trials, while ignoring the fact that only a fraction of the patient population that really benefit from the standard therapy (Figure 1A). With pharmacomics-guided precision hematology/oncology, we will be able to just treat the patients who will benefit from the targeted therapy, while avoid poisoning the other patients with the same pathological diagnosis (Figure 1B).

To keep practicing pathologists, hematologists/oncologists, fellows and residents abreast of precision medicine in hematopathology, the University of Arizona College of Medicine Phoenix Department of Pathology invited experts from the University of Chicago, Fox Chase Cancer Center, Philadelphia, Pennsylvania, Emory University and the University of Arizona Phoenix, to share their experiences and perspectives on the practice of Precision Hematopathology. The Pathology Symposium was held virtually on Saturday, February 5th, 2022. One hundred-ninety-four pathologists, cytogeneticists and molecular pathologists had registered for the meeting, and this issue will be dedicated to the proceeding of this Pathology Symposium.

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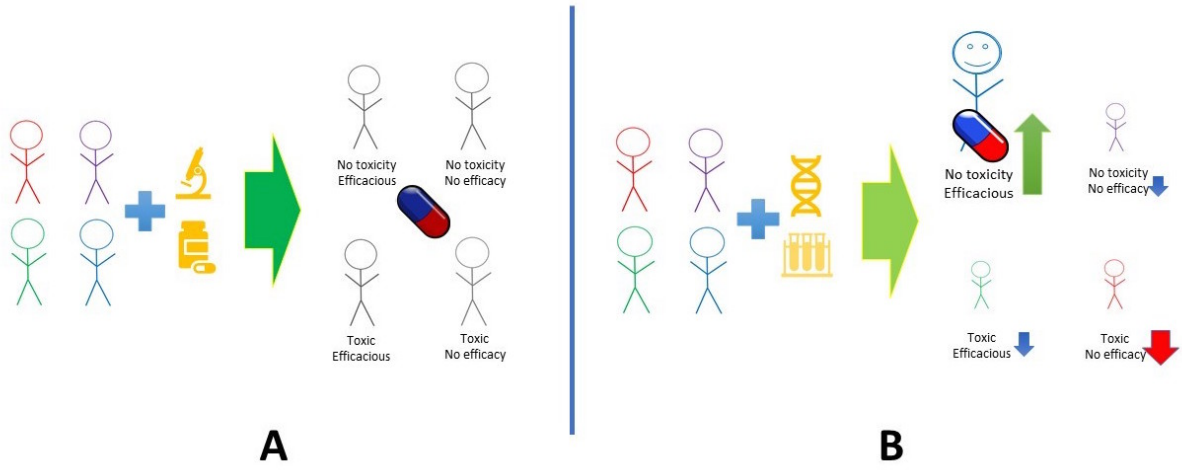

Figure 1: Pharmacomics reduces toxicity and improves efficacy. (A) Current clinical practice; (B) pharmacomics-guided clinical hematology/oncology (modified from the "PHASER" project presentation by Dr. Deepak Voora at the Durham VA Medical Center, Durham, NC).

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