## Preface

Precision medicine aims to take into account individual variability in all aspects including the baseline condition of the whole body, tumor biology, and treatment responses of both tumor and normal organs for each person in order to form the most effective treatment for the best outcome. This is in contrast to the traditional "one-size-fits-all" or "standard" uniform approach, in which treatments are given based on the overall tolerance in the whole patient population, which cures only a small proportion of patients. For lung cancer, the current precision medicine is largely based on targeted systemic therapy, mostly guided by molecular testing of tumor biopsy, which is normally a small sample of tumor, and often limited by the spatial and temporal heterogeneity of the tumor. Tumor tissue biopsy represents "an issue" in that it can be difficult to obtain and may carry sampling errors. This journal issue of *Translational Lung Cancer Research* will focus on the role of imaging and blood-based biomarkers for precision medicine, which may provide a unique angle of guidance on top of the knowledge provided by tissue biopsy for a more holistic view on the patient and lung cancer, aiming to achieve a new level of precision medicine.

Imaging offers distinct features that tissue biopsy does not provide. First, imaging provides a comprehensive 3- to 4-dimensional assessment of tumor heterogeneity without the concerns of sampling errors of tissue biopsy. Second, imaging imaging is non-invasive and can be repeated easily, allowing dynamic monitoring of the tumor biology and responses to treatment. Third, imaging allows assessment of the entire tumor burden, as the tumor extent and biomarker expression can be measured throughout the body. Fourth, imaging can serve as a biomarker to reduce the need for tissue biopsy, large samples sizes, and cost for clinical trials and clinical practice. Last but not least, imaging can be used to evaluate the patient as a whole and their internal organs through evaluation of adjacent normal tissue and their reactions to the presence of the tumor and cancer treatment. In lung cancer, CT and FDG-PET scans have played a crucial role in screening, diagnosis, staging, tumor target delineation, treatment guidance, treatment evaluation, and assessment of recurrent disease. MRI may help determine the presence and the extent of tumor invasion into great vessels and nerves for precise treatment decision-making.

There are significant advances in this field. In this issue, we will begin by describing the resources and grant opportunities of the National Cancer Institute (NCI) of the United States (1), present the quality assurance strategy of IROC for opportunities in clinical trials (2), review current advances in imaging biomarkers through radiomics analysis (3), and discuss the current status and promises of clinical application of imaging and functional imaging-guided precision medicine (4).

Blood-based biomarker testing can detect a systemic effect without need for local spatial information and provide guidance on precision treatment for each individual. It is exciting to consider that a few blood-based biomarkers could be used to assess tumor mutation, monitor or predict the status of the tumor and of the normal tissues to guide precision treatment decisions for targeted treatment and radiation dose prescription. In addition to the recent promising advances made for circulating tumor cells (liquid biopsy) and plasma DNA, there has been a significant number of studies reporting genotypic markers and proteomic markers to predict toxicity of normal tissues, which will provide useful information for precision systemic therapy. Similar to imaging for precision medicine, this focused issue will provide information regarding grant opportunities from NCI (1), quality assurance in blood sampling and processing for biomarker testing (5), review the role of blood markers in diagnosis and prognosis (6), and present potential applications of blood biomarkers for guiding precision treatment involving systemic therapy (7) and local radiation therapy (8).

Finally, the potential of both imaging and blood biomarkers for predicting treatment outcomes and guiding precision medicine continues to advance in lung cancer. Accumulating evidence also shows the potential of these biomarkers in monitoring the immune system of the host, which is critical for achieving tumor control, promoting survival, and minimizing treatment toxicity. Ultimately, imaging and blood-based biomarkers can be incorporated together with tissue biomarkers and treatment variables such as dosimetry to both tumor and normal tissue to guide precision treatment (8). I hope readers will enjoy reading this literature review regarding the current status of imaging and blood biomarker development for precision medicine and find expert guidance for future directions.

## Acknowledgements

None.

 

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doi: 10.21037/tlcr.2017.09.10
*Conflicts of Interest:* The author has no conflicts of interest to declare.
**View this article at:** http://dx.doi.org/10.21037/tlcr.2017.09.10

**Cite this article as:** Kong FM. Preface. Transl Lung Cancer Res 2017;6(6):613-614. doi: 10.21037/tlcr.2017.09.10