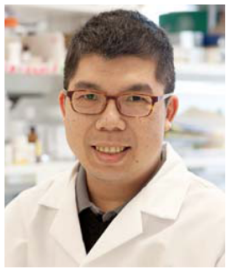
EDITORIAL: Recent Advances in Genetic Mutations of Prokaryotic and Eukaryotic ABC Transporters



Cancer is a devastating disease and the road to cure all cancer is still very challenging. According to the world cancer report 2014, cancer is a leading cause of death worldwide, with 8.2 million deaths in 2012. By 2025, there will be more than 20 million new cancer cases per year in the world [1]. Our current knowledge in cancer biology and discovery of new anticancer therapies have significantly improved curable rate of certain cancers, including several leukemia, lymphoma, and solid tumors like colorectal and breast cancers. Unfortunately, prognosis of patients suffering from advance stage of cancer is still poor. Treatment option for these patients is limited and the treatment effectiveness is usually compromised. Although the so called “targeted drugs” are available but cancer cells are continuously evolving and eventually develop drug resistance, in which renders many chemotherapeutic drugs unable to kill cancer cells. However, the underlying processes of such somatic rearrangement is poorly understood. In recent years, with the technological leap in genome sequencing and comparative analysis, biologists are now having tools to uncover the complex nature of metastatic disease in unprecedented detail.

Most cancer suffering and death are associated with metastasis. Therefore, cancer metastasis is the single most significant problem to deal with the disease. Naoghare *et al* summarized the current understanding of molecular mechanisms leading to metastasis in cancer, and also new directions that could better diagnose metastatic potential in cancer patients. The authors argued that one of the major hurdles for new anti-metastatic drug development is lack of murine models which can physiologically mimic human cancer pathogenesis. Despite this, recent discoveries on the role of cancer stem cells as well as non-coding RNA in cancer metastasis are promising directions towards new therapies.

Chemotherapy is one of the most prominent means to reverse cancer progression. However, cancer patient may develop acquired drug resistance during drug treatment. In human, the ATP-binding cassette (ABC) transporter P-gp is one of the major factors which mediate drug resistance. Since identification of the gene which encodes P-gp more than 30 years ago, numerous effort has been made to reverse drug resistance. Three generations of P-gp modulators have been developed with high specificity *in vitro*, however such effect is minimal in clinical trials. Unfortunately, a high resolution structure of human P-gp is not available and it is critical for the development of novel P-gp inhibitor. In a review written by Fei Zhou and others, it describes the recent advances in molecular structure characterization of P-gp, and current challenges to resolve such protein in high resolution.

The need for the next generation of drugs to cure cancer has never been better. These reviews focus on better understanding the role of genes relating to cancer development as well as consequence of drug treatment. An in-depth understanding of proteins and genes involve in metastasis and drug resistance may offer new opportunities for novel therapeutic interventions.

REFERENCE

[1] Stewart BW, Wild CP. World Cancer Report 2014. International Agency for Research on Cancer, Geneva, Switzerland.

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