Editorial

Biomarkers and personalized medicine for disease diagnosis and treatment

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Jun-Jie Chen
Department of medical research, E-da hospital in Kaohsiung, Taiwan

Correspondence: Jun-Jie Chen, Department of medical research, E-da hospital in Kaohsiung, Rm 10503-2, Incubation and Research Bldg, No. 6, Yi-Da Road, Yan-Chao District, Kaohsiung City 824, Taiwan, Tel +886761511005913, Email 107368@edah.org.tw

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Biomarker is an important tool for disease diagnosis and tracking. Blood pressure, lipid, and sugar are simple example of biomarkers. According to the definition by (Food and Drug Administration, FDA), biomarkers can be any analytic method to detect or to predict general physiological response, disease progression, or patient's therapeutic response and safety to drug treatment. The parameter of metabolite, gene or protein expression regards as an indicator in clinical manifestation.[1]

Base on the clinical reports, experience, and statistics, majority patient are not responsive to pharmacological regimen. For example, 4% to 70% asthma patient is non-responsive to bronchodilators; 50% to 75% patient is only little response to oral hypoglycemic agents. Importantly, cancer patient has no effect after chemotherapy. In addition, systemic anaphylaxis is highly associated with patient genomic profiling. Hence, patient biomarker is critical indicator for providing proper drug treatment and preventing adverse effect. This information triggered the developing trend of personalized medicine.

During the past decade, tumor marker is becoming the most important topic in the field cancer research. It is a crucial reference for physician to treat patient with target therapy. With the feature of, simplicity, high sensitivity and accuracy, current medical technology allowed us to characterize specific molecule from patient's tissue, body fluid, and peripheral blood[2] (Table 1) With the development of next generation sequencing, this technology facilitates clinical physician to diagnose the genetic profile and somatic mutation of patient. Bioinformatic data provide a great evidence for disease characterization and pharmacotherapy. In the case of non small cell lung cancer (NSCLC), Erlotinib is a specific inhibitor to block EGFR which is only used for treatment of patient with EGFR mutation or over expression. Clinical research revealed this drug particularly is effective in the tumor harboring exon 19 or 21 mutation. In the other case, approximately 7% NSCLC patient has EML4-ALK rearrangement, FDA approved ALK inhibitor-Crizotinib for treating this kind indication.

Table 1 Biomarkers for cancer drug

Agents	Biomarker	Indicative group
Afatinib	EGFR	EGFR exon 19 deletion or exon 21 substitution (L858R) mutation positive
Arsenic Trioxide	PLIURARA	PUIL/RARa (t(15:17)) gene expression positive
Bosutinib	BCR/ABL1	Philadelphia chromosome (t(9:22)) positive
Brentuxirnab	TNFRSF8	CD30 positive
Cetuximab	EGFR	EGFR protein expression positive
Cetuximab	KRAS	KRAS codon 12 and 13 mutation negative
Crizotinib	ALK	ALK gene rearrangement positive
Dabrafenib	BRAF	BRAFV600E mutation positive
Dasatinib	BCR/ABL1	Philadelphia chromosome (t(9:22)) positive;T3151 mutation-positive
Denileukin	IL2RA	CD25 antigen positive
Erlotinib	EGFR	EGFR exon 19 deletion or exon 21 substitution (L858R) positive
Exemestane	ESR1	Estrogen receptor positive
Fulvestrant	ESR1	Estrogen receptor positive
Ibriturnomab	L1S4A1	CD20 positive
Lmatinib	BCR/ABL1	Philadelphia chromosome (t(9:22)) positive
Lapatinib	ERBB2	HER2 protein over expression positive
Letrozole	ESR1. PGR	Hormone receptor positive

Table Continued....

Agents	Biomarker	Indicative group
Rlilotinib	BCR/ABL1	Philadelphia chromosome (t(9 :22)) positive
Omacetaxine	BCR/ABL1	BCR-ABL T3151
Panitumumab	KRAS	KRAS cotton 12 and 13 mutation negative
Pertuzumab	ERBB2	HER2 protein over expression positive
Ponatinib	BCR/ABL1	Philadelphia chromosome (t (9; 22)) positive. BCR-ABL T3151 mutation
Rituximab	M S4M	CD20 positive
Tamoxifen	ESR1. PGR	Hormone receptor positive
Trametinib	BRAF	BRAF V600E/K mutation positive
Trastuzumab	ERBB2	HER2 protein over expression positive
Tretinoin	PMURARA	PM1JRAR0 (t(15;17)) gene expression positive
Vemurafenit	BRAF	BRAF V600E mutation positive

On the other hand, biomarkers can be applicable for understanding the mechanism of drug resistance. Cetuximab is a therapeutic monoclonal antibody which is also targeting EGFR. Its indication is for colon cancer. However, some patient with KRAS gene mutation is not eligible for the utilization of this agent.[3]

All these example indicated and emphasized the importance and application of biomarkers in clinical. New diagnostic technology have considerable potential to improve care, target treatment, and reduce the cost of unnecessary prescriptions and the downstream effects of drug resistance and increase the accuracy of pharmacotherapy. The postgenomic era has been launched by significant enthusiasm for therapeutic individualization through the use of pharmacogenomic and other biomarkers. This enthusiasm has been dampened by limited examples of widespread clinical adoption. Future studies of putative biomarkers are likely to give additional information to clearly define which patients receive therapeutic benefit from target therapy.

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Conflict of interest

The author declares no conflict of interest.

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