Editorial **Open Access**

Immune Biomarkers in Predictive and Personalized Medicine

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Since the existence of medicine, its main role was to diagnose and treat disease, but in 21st century the primary goal of medicine must be prediction and prevention of diseases. Predicting the future is not something new for humanity and it's described in ancient Greece as a myth of Oracle of Delphi who made predictions. Doctors as Oracle can predict the future of their patients, but in contrary to the ancient Oracle, their prediction must be evidence-based.

Predictive medicine is a field of medical science and intended not only for patients but predominantly for healthy individuals, its aim being to determine whether the risk of development of disease is increased or not. The results of predictive medicine are expected to be greatest, especially, in the multi-factorial diseases that are prevalent in industrialized countries, such as diabetes mellitus, asthma, hypertension, myocardial infarction, hyperlipidemia, and arteriosclerosis.

Biomarkers are biological measurements which can be applied to predict risk of disease, to accredit forward detection of disease and to monitor the outcome of therapeutic mediations [1]. In this context, the measurements of specific biomarkers are usefulness in predictive medicine. Until now, biomarkers have been used in clinical practice as single tests to describe the modification between the normal and pathological conditions. Increasingly, biomarkers find implementation to predict risk of disease, to stratify different patient groups in terms of clinical response, to improve treatment selection and to observe the outcome of therapeutic interventions so as to develop personalized medicine.

Progress on the recognition of the transient detection biomarkers were quite limited in the 20th century, as most of the focus has been on funding the application of new markers as single test. Each new round of development of technology has created new and promising data in planning and methodology. We have currently identified a large number of candidates' biomarkers, including proteins, nucleic acids, metabolites and tumor cells which can be use both as single tests or as multiplex tests such as proteomics, cytomics and genomics. In fact, the most essential way to predict future disease is based on genetics (e.g. Human Genome Project's) although various validation methods for efficiency and more rigorous clinical trials need to be developed.

Let's imagine the situation when a linguist who is familiar with the alphabet but who does not understand Greek language decides to do the 'mapping' of Homer's book "the Odyssey", he will probably obtain a combinatorial analysis of data by using a personal computer which it allows him to make a claim that the book is successfully decoded. Nevertheless, this linguist is hardly able to comprehend the essence of the text. For the same reason there are doubts about the ability of the Human Genome Project (HGP) as a means of establishing a link between genes and phenotypes.

One new concept for measurement of predictive biomarkers is based on estimate of the role of immune system in regulation of an optimal molecular homeostasis of the organism [2]. Many researchers have studied immune system as immunoregulation of homeostasis by biological activity of different cytokines and chemokines. However, the primary characteristic of the immune system at the molecular level is its ability to produce a number of natural Ab. The hypothesis of Cohen and Young states that the molecular specificity of the body is reflected in the plurality of anti-self receptors of autoreactive T-lymphocytes, a system of which forms the 'immunological homunculus' [3]. Many years later the term 'Immunculus' has been proposed by Poletaev and Osipenko [4] for designation of the global system (network) of constitutively expressed natural autoantibodies (na-Ab) interacting specifically with different self-antigens. In healthy individuals the repertoires of such na-Ab are surprisingly constant and characterized by minimal individual quantitative variations [4].

It is by now well established that non autoimmune diseases such as diabetes mellitus, asthma, hypertension, arteriosclerosis etc. are accompanied by immune responses and that the possibility of disease studying, early diagnostics or evaluation of target organ damage might be evaluated by immune biomarkers [5,6].

On the other hand the predictive medicine gives rise to a number of sensitive ethical issues and questions.

- Will testing be accomplished only if the disease requires a specific treatment?

- How long before the beginning of clinical symptoms autoantibodies are detectable?

- How can the quality and validity of tests be ensured? It is well know that the different laboratory, reagent and method of detection have different sensitivity and specificity of each.

- What roles other factors play in performance of the tests, such as environment and lifestyle? Could we also study factors like these?

- Will the results of predictive tests be made available to employers or insurance agencies?

An evidence-based health service tends to generate an increase in the competence of health service. The answers to these questions by the scientists strengthens the motivation of any health manager to use new methods when making a decision and details of this approach to health services and public health.

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