Novel Biomarkers

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The term biomarkers refer to physical or biochemical parameters, indicating specific physiological and or pathological process in the body. These indicators are helpful to provide vital information in the diagnosis and prognosis of diseases. These are even helpful in prediction of response to therapeutic agents. The growing interests and importance of the role of biomarkers in medicine has tempted scientists to explore more specific and sensitive biomarkers.

With the advent of new technologies in diagnostic science, novel biomarkers have been studied and established as specific as well as reliable indicators of various physiological and pathological processes and progressions. Dramatic progress has been noted from conventional laboratory testing to modern automated and robotic instruments, with enhanced throughput and reliability. This technological development from end point analysis to magnetic immunoassay and florescence assay methods have led to the introduction of new biomarkers in diagnostic science.

Biomarkers generally include a wide variety of chemical components of the body, ranging from trace elements, micro molecules, such as glucose urea, creatinine etc. to macro molecules. Children with autism spectrum disorder (ASD) has been found to have high concentration of lead (Pb) and low zinc (Zn) and magnesium (Mg) concentration in the teeth[1].

Serum fructose amine concentration is a helpful indicator of glycemic fluctuation over a period of previous 1-4 weeks. Fructose amine is ketoamine, which is formed by the glycosylation of serum protein specially albumin. It is a reflection of the average glucose concentration[2]. It is preferred for its high specificity, cost effectiveness and sample feasibility, as it does not require fasting blood sample. Normal blood level ranges from 175-280 mm/L for non diabetic persons and below 420mm/L for controlled diabetics[2].

Chloestenoic acid (CA) is 3-beta hydroxy-5-Cholestenoic acid is formed from cholesterol by the action of sterol-27- hydroxylase (CYP27A1) in inner mitochondrial membrane. It is an oxy sterol. Its blood level is considered as marker of acute respiratory distress syndrome (ARDS). Blood CA level has been reported to be reduced by 50% after pneumonectomy. It is believed to be required for the alveolar macrophages normal functioning and thereby contributing to circulatory CA. Hence reduced blood level of CA is belied to be found in ARDS, and is also helpful prognostic marker of the dissease[3].

Apart from various cellular micro molecules and numerous enzymes, used as pathological markers in medicines since decades, macro biological molecules of polypeptide and poly nucleotide origins have drawn attention to improve diagnosis and prognosis of diseases, more specifically in the progressive pathological conditions.

IGRA (interferon gamma release assay), also named as quantiferon TB gold (QFT), is a whole blood assay to check for a person's exposure to Mycobacterium tuberculosis. It is used as alternative to purified protein derivative test (PPD) or Mantoux skin tuberculosis test[4].

Cystatin C is a proteomic marker, having peptidase inhibition activity. Its normal serum level (0.60 1.15mg/L) is indicative of normal kidney functioning. The value is elevated in acute kidney injury. Recently, the role of this protein marker in prediction of deteriorating cardiovascular diseases has also been studied[5].

Aflatoxins represent variety of fungal origin carcinogens out of which aflatoxin B_1 is a liver carcinogen. It is believed to have more potent carcinogenic effect in malnurished individuals, especially pyridoxine (vitamin B_6) deficiency. Aflatoxin is helpful in early detection and hence management of persons at risk of hepatocellular carcinoma[6].

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AMH (Anti-mullerian hormone)is produced by ovaries. The hormone decreases significantly before menopause. It is considered as marker of risk for development of breast CA[7].

MicroRNA(miRNA) are short non-coding RNA pieces believed to have an important role in regulation of genes and inhibit the destabilization of mRNA. Exosomal miRNA has become a focus because of their critical role in modulating the processes which interfere with cancer immunity. It is also believed that cancer cells intercommunicate through exosomal signalling miRNAs. Due to its stability and presence in body fluids, these molecules are non-invasive biomarkers in various types of cancers. Hence valuable tool in treatment and presentation of malignancies[8].

Similarly circulating tumor DNA (ct DNA) is a product of normal cells replaced by cancerous cells and hence found in systemic circulation can be used as indicator for relapse of tumor. Its concentration depends on the type and stage of tumor. ct DNA level is helpful in diagnosis, guideline for specific treatment, monitoring and remission of cancer[9].

Covelently closed circular DNA, cccDNA, is double stranded closed ring DNA, arising from viral propagation. It is found in the circulation of persons infected with hepatitis B virus. Its relative quantity is also used as prognostic marker[10].

These biomarkers, along with many other emerging, though are not commonly asked at present, are expected to be become part of the usual biochemical investigations. Which will surely add to the diagnosis and prognosis of various diseases.

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