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Circulating microRNAs as novel disease biomarkers

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MicroRNAs (miRNAs) constitute a large family of short noncoding RNA sequences synthesized in the cell nucleus; the human genome contains more than 2500 mature miRNAs. These nucleotides modulate gene expression and regulate a wide range of biological processes as cell differentiation, proliferation and development, cell-to-cell communication, cell metabolism and apoptosis. miRNAs are contained in tissue cells but they are also detectable in extracellular sites, as plasma and other body fluids; miRNAs were also detected in platelets, erythrocytes and nucleated blood cells. There is evidence that miRNAs have a role in molecular mechanisms linked to cellular pathways of certain diseases, as viral infections, cancer, diabetes and cardiovascular disease. The expression of some miRNAs is closely correlated with cancer development and progression, and the study of miRNA has become a rapidly emerging field in oncology; it was suggested that these circulating nucleotides may be used for early diagnosis, staging, follow up, assessment of therapeutic responses and therapy outcomes in cancer patients. The potential role of different miRNAs in cardiovascular diseases has been widely recognized; some heart-specific miRNAs are consistently increased in plasma of patients with acute myocardial infarction within few hours after the onset of infarction, thus miRNAs might be used to detect and monitor myocardial injury. Some studies have considered a possible role of circulating miRNAs as biomarkers for atherosclerotic disease; in other researches miRNAs seem to play a determinant role in several processes involving lipid biosynthesis, lipoprotein metabolism, endothelial cell biology and vascular function. miRNAs expression was also investigated in diabetes mellitus; *in vitro*, *in vivo* and clinical studies have revealed the association between miRNAs and some processes of insulin production and release, as cellular membrane electrical excitability, insulin granule exocytosis and insulin synthesis in pancreatic beta cells. Circulating miRNAs might offer greater advantages in terms of sensitivity and specificity.

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