

The Potential of Non-Coding RNA as Cancer Biomarkers

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A distinct and measurable change in a biological substance in a living system is termed a biomarker. Biomarkers can be used to distinguish and characterise normal and abnormal conditions in an organism. Over the years, a wide variety of biomarkers have been identified to be associated with different types of cancers. These can come in the form of proteins, DNA or RNA. Many protein-coding RNA (mRNA) molecules have been widely studied for their oncological significance. However, recent studies imply that non-coding RNA molecules have great potential for being used as cancer biomarkers. In this regard, different types of non-coding RNA have been studied, including microRNA (miRNA), long noncoding RNA (lncRNA), small nucleolar RNA (snoRNA), Piwi-interacting RNA (piRNA) and circular RNA (circRNA). These RNA molecules can be found in both intracellular and extracellular compartments. Extracellular RNA (exRNA) molecules provide a unique platform for the non-invasive diagnosis of cancer as they can be found abundantly in blood, saliva and other biofluids. These molecules associate with other lipids or proteins and are transported via extracellular vesicles to carry out specific cell signalling. These vesicles are secreted by cancer-causing cells at a larger scale than healthy cells. Moreover, they have also been demonstrated to be associated with cancer progression. As such, they have high clinical relevance for cancer diagnosis and prognosis. A recent study conducted by Shangguan et al. (2020) showed that a certain circRNA molecule was up-regulated in non-small-cell lung cancer (NSCLC). They also predicted that the circRNA could be associated with glycolysis and cellular proliferation, which are considered two very important hallmarks of cancer. Another recent study conducted by Zhan et al. (2020) points toward the association of lncRNA in bladder cancer progression. They studied a newly discovered lncRNA called cancer susceptibility 9 (CASC9) and their results suggest that it affects several cellular pathways that lead to tumour growth and cancer metastasis. These studies are clear evidence that denotes that non-coding RNA molecules as powerful cancer biomarkers. The diagnosis, prognosis and treatment of cancer are very challenging; the identification and characterisation of novel non-coding RNAs and exRNAs as potential cancer-associated biomarkers has thus become essential. An enriched understanding of the complex cellular pathways and regulatory networks of these RNA molecules can direct advanced approaches for better biomarker screening and enhanced drug design.

Keywords: Cancer, Biomarker, RNA, non-coding RNA, exRNA

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