

Novel approaches to cancer treatment encoded within non-coding RNA

A hallmark of all living organisms is the presence of genetic material within each cell; this material is invariantly composed of a specific class of biological molecules known as the nucleic acids. While the more familiar variety of these nucleic acids – DNA – is effectively a household term, its sister class of nucleic acids – known as RNA – is far less renowned in non-scientific circles. Nevertheless, the study of RNA has experienced a period of rapid growth during the 21st century, ushered in by advances in biotechnology that has rendered them more amenable to study. This has led to the discovery of previously unknown varieties of RNA with structures and functions entirely distinct from those of the traditionally known RNA types (such as messenger RNA, or “mRNA”). One recent example is a class of RNAs now entitled Long Non-Coding RNAs (lncRNAs) – “non-coding” signifying that these RNAs do not code for the genetic information needed to produce a protein product (like mRNAs do).

Unfortunately, the purpose of lncRNAs remains incompletely understood. This is partly due to their novelty as the subject of scientific inquiry, but also because they perform a large and highly complex list of functions in the cell. Notwithstanding several exceptions, the functions of all lncRNAs can collectively be grouped together under the broad designation of gene expression regulators. Within this framework, lncRNAs have proven themselves to be highly resourceful in how they go about accomplishing their purpose, which often involves regulating other regulators rather than directly altering gene expression of their own accord. Importantly, their crucial role in maintaining normal gene expression has raised concern over whether they may contribute to human disease – specifically cancer, given that the molecular origins of the cancer development process are highly genetic in nature. Not surprisingly then, there is a now wealth of evidence linking lncRNA malfunction with the development of a multitude of different malignancies. As with protein coding RNAs, there are lncRNAs that appear to enhance cancer initiation and progression, as well as those that suppress it. Fortunately, the growing awareness of these regulators has presented medical science with a new and untapped avenue for treating cancer, where therapeutics designed to restore lncRNA homeostasis might yield significant clinical benefit in patients with cancers harboring dysfunctional lncRNAs. They may additionally be used to assess and better understand the specific molecular features of a particular patient’s tumor (which generally are unique and distinctive from patient to patient), and also to enhance the sensitivity of cancer diagnostics.

Their potential to improve detection strategies makes them especially attractive in the case of cancers that are highly responsive to early-stage treatment. Prostate carcinoma is a poignant example of this, primarily because of the sheer prevalence of this disease in men, among whom it represents the most commonly occurring (non-skin) malignancy. Given the significant improvement in outcomes which early diagnosis and treatment confers in prostate cancer patients, any biomarkers which can enhance early detection would provide significant clinical benefit to this population. Although much remains uncertain about the precise function of them, lncRNAs

nonetheless are poised to play a key role in the future of cancer management, where personalized, genomic approaches to therapy will be increasingly utilized in management of the patient.

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Publication

[Role of Long Noncoding RNAs in Neoplasia: Special Emphasis on Prostate Cancer.](#)

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Int Rev Cell Mol Biol. 2016