'Quiet revolution' may herald new RNA therapeutics

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Scientists at the University of Oxford have identified a surprising way of switching off a gene involved in cell division. The mechanism involves a form of RNA, a chemical found in cell nuclei, whose role was previously unknown, and could have implications for preventing the growth of tumour cells.

RNA plays an important and direct role in the synthesis of proteins, the building blocks of our bodies. However, scientists have known for some time that not all types of RNA are directly involved in protein synthesis. Now, in research funded by the Wellcome Trust and the Medical Research Council, a team of scientists has shown that one particular type of RNA plays a key role in regulating the gene implicated in control of tumour growth. The research is published online today in *Nature*.

The Human Genome Project identified about 34,000 genes responsible for producing proteins. The remaining part – in fact, most of the genome – constituted what was considered to be "junk" DNA with no function. However, latest estimates show that this "junk" DNA produces around half a million varieties of RNA of unknown functions.

"There's been a quiet revolution taking place in biology during the past few years over the role of RNA," says Dr Alexandre Akoulitchev, a Senior Research Fellow at the University of Oxford. "Scientists have begun to see 'junk' DNA as having a very important function. The variety of RNA types produced from this "junk" is staggering and the functional implications are huge."

The particular form of RNA that has been of interest to Dr Akoulitchev's team is involved in regulation of the dihydrofolate reductase gene (DHFR), determining whether the gene is "on" or "off". The DHFR gene produces an enzyme that controls thymine production, necessary in rapidly dividing cells.

"Inhibiting the DHFR gene could help prevent the growth of neoplastic cancerous cells, ordinary cells which develop into tumour cells, such as in prostate cancer cells," explains Dr Akoulitchev. "In fact, the first anti-cancer drug, Methotrexate, acts by binding and inhibiting the enzyme produced by this gene."

Dr Akoulitchev believes that understanding how we can use the RNA to switch off or inhibit DHFR and other genes may have important therapeutic implications for developing new anti-cancer treatments.

Source: Wellcome Trust