The RNA alphabet—the key role played by hmC

January 15 2016

Led by François Fuks from the ULB's Laboratory of Cancer Epigenetics and the ULB-Cancer Research Center (U-CRC), researchers have revealed for the first time the key role played by one of the RNA letters, hmC or hydroxymethylation. Published in the prestigious Science journal, their discovery will help us better understand such diseases as cancer.

DNA is made up of 4 letters or nucleotides (A, T, G, C), the sequence of which determines our genome. We know that there is a fifth letter completing the genome: DNA methylation (mC). This helps in cell specialisation through controlling the expression of certain genes. When these genes are not correctly methylated, there is a risk of their expression being altered, leading to the emergence of such diseases as cancer. Therapies correcting such methylation faults are already being used to treat cancer.

RNA is the other molecule of life. For several years now, we have been witnessing a paradigm change, with RNA now seen as being just as important as DNA in understanding the book of life. Indeed, it would seem that RNA is not just an intermediary between DNA and protein, but is capable of explaining several major mysteries in the study of life, such as the origin of life and the "junk DNA" paradox.

Through putting the spotlight on RNA, a completely new research path emerges: the complex RNA alphabet (or RNA epigenetics). Just as with DNA, in addition to the 4 well-known letters (A, U, G, C), there are

further letters defining the chemical properties of RNA. Yet the importance of RNA epigenetics for cell development remains unexplored ...

The recent work of the team led by Prof. François Fuks, head of the ULB Faculty of Medicine's Laboratory of Cancer Epigenetics and of the ULB Cancer Research Center, U-CRC, has revealed the key role played by one of these RNA letters, hydroxymethylation (hmC).

Using fruit flies, one of the most common model organisms in biology, the ULB researchers have shown that hmC promotes the translation of RNA into proteins. In addition, following the introduction of a new high-performance sequencing technology, they have fully mapped the epigenetics of hmC. Last but not least, François Fuks and his colleagues have demonstrated the essential role played by hmC in cell development: when hmC production was impeded, the flies died.

Details of this work, part of the quickly growing body of research into RNA, are published in the 15 January 2016 issue of the prestigious *Science* journal. These discoveries are set not just to start a new chapter in our understanding of life, but should also greatly help us in understanding such diseases as cancer.

More information: B. Delatte et al. Transcriptome-wide distribution and function of RNA hydroxymethylcytosine, *Science* (2016). DOI: 10.1126/science.aac5253

Provided by Université libre de Bruxelles