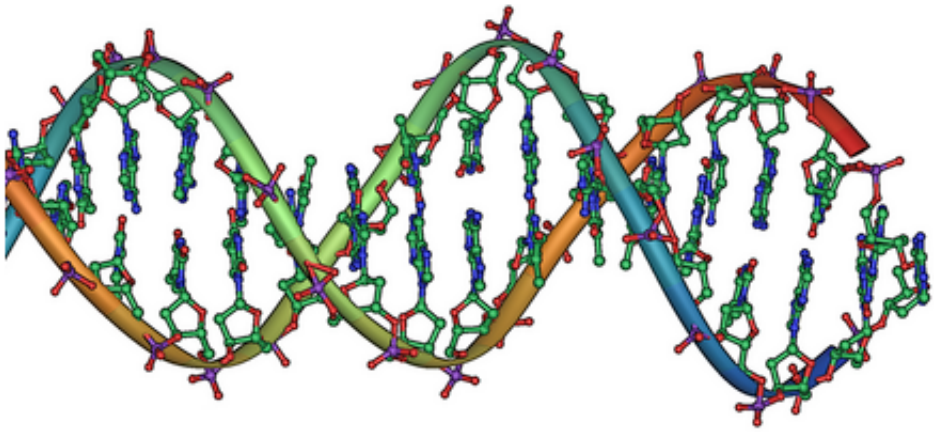
Researchers report possible discovery of sixth DNA base, methyl-adenine

May 5 2015



DNA double helix. Credit: public domain

DNA (deoxyribonucleic acid) is the main component of our genetic material. It is formed by combining four parts: adenine, cytosine, guanine and thymine (A, C, G and T), called bases of DNA. They combine in thousands of possible sequences to provide the genetic variability that enables the wealth of aspects and functions of living beings.

Two more bases: Methyl-cytosine and Methyl-adenine

In the early 80s, to these four "classic" bases of DNA was added a fifth: the methyl-cytosine (mC) derived from cytosine. And in the late 1990s, mC was recognized as the main cause of epigenetic mechanisms, able to switch genes on or off depending on the physiological needs of each tissue.

In recent years, interest in this fifth DNA base has increased by showing that alterations in methyl-cytosine contribute to the development of many human diseases, including cancer.

Today, an article published in *Cell* by Manel Esteller, director of the Epigenetics and Cancer Biology Program of the Bellvitge Biomedical Research Institute (IDIBELL), ICREA researcher and professor of genetics at the University of Barcelona, describes the possible existence of a sixth DNA base, methyl-adenine (mA), which also helps determine the epigenome and would therefore be key in the life of the cells.

In bacteria and in complex organisms

"It has been known for years that bacteria, evolutionarily very distant living organisms, had mA in its genome with a protective function against the insertion of genetic material from other organisms. But it was believed that this was a phenomenon of primitive cells and it was very static," says Manel Esteller.

"However, this issue of *Cell* publishes three papers suggesting that more complex cells called eukaryotes, such as human body cells, also present a sixth DNA base. These studies suggest that algae, worms and flies possess mA, and it acts to regulate the expression of certain genes, thus constituting a new epigenetic mark. This work is possible thanks to the development of analytical methods with high sensitivity, because levels of mA in described genomes are low. In addition, it seems that mA

would play a specific role in stem cells and early stages of development," explains the researcher.

"Now the challenge we face is to confirm this data and find out whether mammals, including humans, also have this sixth DNA base, and consider what its role is".

More information: Heyn H, Esteller M. An Adenine Code for DNA: A Second Life for N6-Methyladenine. *Cell* (2015).dx.doi.org/10.1016/j.cell.2015.04.021

Provided by IDIBELL-Bellvitge Biomedical Research Institute