

Evolutionarily preserved mechanism governs use of genes

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Researchers at Uppsala University have found that the protein coding parts of a gene are packed in special nucleosomes. The same type of packaging is found in the roundworm *C elegans*, which is a primeval relative of humans. The mechanism can thereby be traced back a billion years in time, according to the study presented in the journal *Genome Research*.

Human <u>genes</u> are packed in nucleosomes, which contain epigenetic signals directing how the genes are to be used. The <u>cell nucleus</u> contains DNA, which is wound around proteins to form units called nucleosomes, not unlike pearls on a string. Genes on average contain ten protein coding units called exons.

Previously there was no known correlation between nucleosomes and exons. New results show that nucleosomes are placed over exons. This means that the area containing the protein code is packed in discrete units. These results are presented by a research team at Uppsala University, led by Professor Claes Wadelius at the Department of Genetics and Pathology and Professor Jan Komorowski at the Linnaeus Centre for Bioinformatics as well as University of Warsaw.

Epigenetics is a cellular memory which identifies a cell's identity and way to respond to the environment. Epigenetic signals control genes in a flexible manner. Each genetic package, or pearl on the string, has an epigenetic signal indicating how active it is. In the present study it was shown that there is a previously undiscovered epigenetic mark on protein



coding parts of the gene.

"A gene can be read in several ways and create different proteins. We have now demonstrated that there is an epigenetic control that determines which parts of the gene that are read," says Claes Wadelius.

The study is based on extremely large amounts of data published by other scientists, but not previously analyzed in such detail.

"Our findings show the value of sophisticated bioinformatic analyses and the need to delve deeper into the gigantic amounts of data from modern biological research," says Jan Komorowski.

The scientists also show that the same type of genetic packaging exists in the tiny <u>roundworm C elegans</u>. Humans are related to this worm through a common ancestor that lived a billion years ago. This means that the mechanism has been evolutionarily preserved during nearly one fourth of the time the earth has existed eller one fourth of earth's existence. In humans, the genetic code has been divided into smaller parts that fit into the individual packages or pearls.

"This enables a gene to be used in several different ways. This has probably contributed to human development," concludes Professor Claes Wadelius.

More information: genome.cshlp.org/content/early092353.109.abstract

Source: Uppsala University (<u>news</u> : <u>web</u>)

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