DESCRIPTION FOR THE GENERAL PUBLIC

The human body is built up of billions of cells. Some of them can conduct electricity and are responsible for mental processes. Others take part in our body's defense against bacteria and viruses, and still, others allow us to work physically. The information about their construction is encoded in DNA, and each cell has the same genetic information. A single cell store encoded in DNA information about the structure of the whole body. All this information is not used at the same time but only a part that is currently necessary. The selectivity of information transcribed from DNA determines the diversity of individual cells and organs such as the eye or ear. The DNA molecule has a very compact structure. Human DNA molecule has 2 m length and must fit into the nucleus with approx. 6 micrometers diameter that is 0.006 mm. To make this possible, the DNA in eukaryotes is compacted together with proteins called histones and resembles a string of beads. Such a string of beads called chromatin forms more complicated structures that further allow condensing DNA better. To decode the information from DNA, there must exist very sophisticated tools to do it. Such tools are chromatin remodeling complexes. These specialized protein complexes allow reaching the most entangled, remote fragments of DNA strands. Reading (transcription) and decode the same DNA information can give more than one result. This means that from one DNA fragment, it is possible to receive several different variants of the edited information. Such reading of the same information in several ways is called alternative transcription. Alternative transcription is one of the reasons for cell and organ diversity.

Researchers have verified that in both human and in a plant commonly used as an object of research in molecular biology – Arabidopsis, complexes that remodel chromatin can be involved in the different reading of the same information encoded by the DNA. Moreover, dysfunction of these complexes in humans is associated with the occurrence of many severe diseases such as Nicolaides-Baraitser and Coffin-Siris syndromes and cancer.

In this project, we plan to investigate a new hitherto unknown role of the chromatin remodeling complexes in the different readings of the same information encoded in the DNA of various cell types.

The results obtained during this project will significantly expand current knowledge about a new role of complexes that remodel chromatin structure in choice of the various start sites of reading information encoded by the DNA fragments and its organ-specific dependence on the selection.

The expected results will also be used for science popularizing, constructing new scientific projects, and as a basis for Ph.D. thesis and in habilitation procedure of the project Principal Investigator. In addition, the results of this project may significantly bring, us closer to understanding the relationship between chromatin remodeling and the regulation of alternative RNA-processing in other eukaryotes, including a better comprehension of the molecular mechanisms of human diseases.