

Each sexually reproducing organism has a double set of genes – one from the father, and one from the mother. The formation of gametes (in humans: egg cells and sperm cells) takes place during meiosis, which reduces the genetic material by half. So when a sperm cell penetrates and fertilizes an egg, the genetic information combines and the daughter organism will also have a double set of genes.

Crossovers take place during meiosis and have two important functions. First, a crossover provides the exchange of genetic material between parental chromosomes. Thanks to this, siblings are different from each other, even though they have the same parents. Additionally, crossover plays a very important role in ensuring proper segregation of chromosomes into daughter cells, which results in gametes containing only one chromosome from each pair. Inappropriate segregation of chromosomes into gametes is a common cause of many diseases.

The number and location of crossover events are tightly controlled. They occur at recombination hotspot regions – regions with higher recombination frequency. Our latest research enabled us to discover a new such region in the genome of a model plant, *Arabidopsis thaliana*, that has three adjacent recombination hotspots. Using a new method developed by us, allowing for precise determination of crossover sites, we have the opportunity to check the effect of various factors on recombination.

In this project, we are going to investigate one of the factors influencing the occurrence of recombination events, which is DNA polymorphism. This is a difference between two chromosomes, which may affect the different structure of proteins, which in turn is associated with the occurrence of different characteristics between individuals. Recent studies have shown that in *Arabidopsis*, the polymorphic regions are the preferred sites for crossovers at the genome-wide scale. However, too big differences between the DNA sequences result in local inhibition of recombination in these regions. During our research we will try to understand the influence of different types of polymorphisms on recombination in three adjacent recombination hotspots. The conducted experiments will shed light on the phenomenon of competition between adjacent meiotic hotspots and whether the decision where the crossover takes place is related to sequence differences between the parental chromosomes.

It is extremely important to understand the influence of factors stimulating recombination at the level of recombination hotspots. This knowledge can contribute to targeting the crossover events into such DNA regions that will allow the selection of genes that determine resistance to changing climatic conditions, or ensure higher yields in crops.