DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Workings of each living cell is dependent on presence of correct DNA, which is the carrier of genetic information. Therefore, the integrity of the DNA and the presence of mechanisms that are involved in the repair of this important cell structure is critical. Every cell is exposed to various factors that damage the genetic material, such as ultraviolet light or mutagenic compounds or reactive oxygen species. There is an additional danger during every DNA replication, because the enzyme which is responsible for this process can insert incorrect nucleotides. If the faults that occur during replication are not repaired, it results in a spontaneous mutation. During the evolution cells have developed various mechanisms to repair these defects. One of them is homologous recombination (HR) which can repair DNA double-strand breaks. This process involves many proteins. The key role in HR is played by Rad51, which binds to DNA and forms the nucleofilament around the damage. Protein mediators are also needed to stabilize the resulting structure. In *Schizosaccharomyces pombe* there were described two complexes of mediators - Swi5/Sfr1 and Rad55/Rad57 involved in the Rad51-dependent HR. Their action is independent from each other.

The main aim of this project is to compare the action of Srs2 helicase with Rrp1 and Rrp2 in a Swi5/Sfr1 – dependent pathway. Rrp1 and Rrp2 are paralogs of Uls1protein, SUMO- dependent ubiquitin ligase which is present in *Saccharomyces cerevisiae*. Rrp1 and Rrp2, which are DNA-dependent ATPases, possibly belong to the family of SUMO-dependent ubiquitin ligases. These proteins have specific domains: N-terminal SnF2 domain which is involved in chromatin remodeling and DNA repair and C-terminal helicase domain which suggests helicase activity. Srs2 helicase belongs to the family of SF1 helicases and contains new region at the C-terminus, which is responsible for attachment of the protein (interaction with PCNA), and post-translational modification such as sumoylation or phosphorylation. Srs2 sequence in *S. pombe* does not include motifs for interaction with PCNA nor SUMO. We know that Srs2 works on the same HR pathway as Rrp1-Rrp2 complex. The main purpose of this project is to compare the effects of Rrp1 and Rrp2 proteins with Srs2 helicase on the pathway mediated by HR mediators, Swi5-Sfr1. We want to determine whether the Rrp1 and Rrp2 proteins act with the Srs2 helicase as a complex, or independently. First the physical interaction between these proteins will be tested. Second, whether the interaction Rrp1, Rrp2 and Srs2 proteins with Sfr1 and Swi5, are the same or different.

Work on the S. *pombe* has many advantages. Firstly, it is an excellent model organism, which is suitable for studying the mechanisms of DNA repair. Secondly, since many metabolic pathways in eukaryotes are highly conserved, the results obtained in yeast can be applied to human cells. Thirdly, the work is fast and cheap.

The results obtained in this project will be helpful in expanding the knowledge in the field of homologous recombination mediators. Understanding the mechanisms connecting different pathways of HR will provide increased knowledge concerning the maintenance of genomic stability, which is extremely important in the context of many cancers.