The replication of genetic material is one of the fundamental metabolic processes in the living cell. The genetic stability as well as precise functioning of the organism depends on proper regulation of this process. Copying the DNA during the replication, preceding the cell division, is performed by complex of enzymes. These enzymes are responsible for rate, accuracy and efficiency of the process. The complexity of the replication and its dependency of the available energy sources requires the precise regulation of this process. DNA replication is regulated on many steps, at the beginning (initiation), though elongation which basically is "ongoing" of this process, till its end – the termination of replication.

The research on the replication process during last decades helped in the characterization of the replication factory elements and understanding of the role of its components. Many enzymes are involved in the process of DNA double helix synthesis, such as: proteins altering the DNA structure, enzymes synthesizing nucleic acids, proteins responsible for the accuracy of copying process and correction of occurring errors. Nevertheless, till now, the entire picture of the molecular mechanisms, regulating this fundamental process, is not fully understood.

The recent reports, including our team research data, show that the process of DNA replication it not independent, but is deeply connected with vast network of factors linking it with other cellular processes. Despite the common knowledge about the physiological condition of the cell affecting DNA replication, only recently mechanisms involved in this connection have been reported, correlating the primary metabolism and the replication process. In our studies on model *Escherichia coli* bacterium, we showed that defects caused by mutations in the genes encoding replication enzymes can be suppressed by defects in enzymes of central carbon metabolism. This discovery supported the hypothesis about the correlation of these two important processes and their adjustment to changing environmental conditions. Many regulatory mechanisms exist in bacterial cells involving metabolic signalization or specific alarmon factors, therefore, it can be hypothesized that the replication process can be dynamically regulated through such mechanisms.

In this project we plan to take advantage of our experience in the studies of DNA replication process, and basing on our previous results, we propose the research on mechanisms of modulation of DNA replication by cellular stress responses, such as the stringent response caused by stress and nutrient limitations. Our preliminary work with mutants defective in stringent response indicate the possibility of such regulation. In planned research we expect to elucidate this mechanism.