Chronic myeloid leukemia (CML) is a model neoplasm, studies on this disease resulted in landmark discoveries and started the era of targeted therapy in oncology; for the first time in CML genetic abnormality was linked to cancer, also for the first time studies on the pathogenesis of this disease led to the successful introduction of targeted therapy with small molecule tyrosine kinase inhibitors (TKI). Unfortunately, significant number of patients develop resistance to TKI, another problem in CML is inability to cure CML due to the intrinsic resistance of small fraction of cells, called leukemic stem cells, which are insensitive to TKI. CML starts in hematopoietic stem cell, which, after a genetic event, formation of Philadelphia chromosome, a result of reciprocal translocation between chromosomes 9 and 22 - t(9;22)(q34;q11) undergoes malignant transformation into leukemic stem cell. Leukemic stem cells constitute major obstacle in successful curative treatment of CML. Since they are resistant to TKI, therapy with imatinib or second-generation inhibitors does not eliminate those cells. In the course of the disease leukemic stem cells accumulate additional genetic aberrations due to genomic instability. These genetic events may affect chromosomes (e.g. new translocations) or may be point mutations, which can confer resistance to TKI. Interestingly, chromosome changes are accompanied by telomere shortage. Telomeres as nucleoprotein structures located on chromosome ends are key regulators of genomic stability and telomerase is responsible for the maintenance of telomere length.. This important discovery by E. Blackburn, C. Greider and J. Szostak was awarded Nobel Prize in 2009 in physiology and medicine. However, telomeres may be also elongated by recombination-based alternative mechanism and immortal cancer cells are frequently characterized by the lack of telomerase expression/activity. This may suggest that the system regulating telomere homeostasis is more complex than previously thought. Elucidation the mechanisms controlling telomere status is important for better understanding of the causes of chromosome damage as well as for diagnostic and prognostic issues. The obtained results indicate that secondary chromosome damage may be linked to changes within telomeres. We found that differences in telomere length in CML cells were accompanied by the lack or very low expression of *TERC* and *TERT* genes (telomerase subunits) and changes in the expression of proteins of shelterin (telomere-associated) complex. We hypothesize that telomeric complex may have a role in drug resistance and disease progression.

Detailed description of the molecular mechanisms underlying genomic instability in CML cells, especially leukemic stem cells during progression, may help to find new therapeutic modalities in patients who progressed despite TKI therapy. It may also increase our knowledge on the role of telomeres and telomeric complex in cancer cells.