Great progress has been achieved in the diagnostics and therapy of childhood acute lymphoblastic leukemia (ALL) during the last few decades and the permanent cure rate for children and adolescents has risen to nearly 90%. The basic principle of ALL treatment is to split patients into several groups receiving treatment of different intensity according to exactly defined prognostic features. This is aimed at reducing both the risk of relapse and toxic complications of treatment.

The development of new diagnostic methods, especially in the field of molecular genetics and flow cytometry, allowed further improvements in the risk stratification - the minimal residual disease (MRD) has become a crucial prognostic factor in modern treatment protocols for pediatric ALL as a sensitive marker of both response to therapy and subclinical leukemic involvement of various tissues of the organism. Nevertheless, there is still an intensive search for new markers that would enable even more precise characterization of the leukemic clone, and treatment strategies reflecting the biology of leukemic cells are being optimized.

The first part of our study describes the monitoring and prognostic impact of MRD in peripheral blood of children with ALL with emphasis on very early time points of treatment. MRD was examined by the quantification of immunoglobulin and T-cell receptor (Ig/TCR) gene rearrangements.

In the second part of our study, we focused on the characteristics, prognosis and therapy of childhood acute hybrid leukemia, or mixed phenotype acute leukemia (AHL, MPAL). We studied both acute leukemias with significant expression of molecules that are physiologically expressed in a different lineage, and acute leukemias with a switch from one lineage to another during an early treatment induction phase. These rare subtypes of acute leukemia have been insufficiently explored and their treatment has remained elusive.