

Acute lymphoblastic leukemia (ALL) represents a malignant proliferation of lymphoid cells blocked at an early stage of cell differentiation. ALL is the most common cancer occurring in children, with the peak incidence at 2 to 5 years, and predominance among boys. The overall survival rates of patients with childhood acute lymphoblastic leukemia show great improvement in recent years, reaching approximately 90% in patients with good prognosis. Despite rather successful treatment, the prognosis for the remaining 10% who have relapsed or show insufficient improvement during treatment remains poor. Acute lymphoblastic leukemia is still the second most common cause of cancer-related death among children. It has been suggested that children with ALL are born with a weakened immune function that together with postnatal environmental exposures leads to onset of childhood ALL. However, despite publications on the changes within the immune cells in the course of acute lymphoblastic leukemia in pediatric patients, there seems to be limited focus on a large-scale analysis, involving omics techniques, with additional correlation of the data with prognosis and clinical manifestation.

Therefore, the aim of this project is a large-scale analysis of immune cells and the expression of anti-tumor response related genes of pediatric patients with pre-B acute lymphoblastic leukemia at different times during their diagnosis and treatment. With the use of in-depth biostatistical analysis of such complex data, the project is set to establish effective monitoring of the disease progression and possible relapse. In the longer term, the obtained data could be the basis for the development of innovative specific immunotherapeutic targets, which are the basis for the treatment of patients who do not respond adequately to standard chemotherapy. Recent scientific reports suggest that long-term remission may be associated with additional factors other than the genetic subtype of leukemia and the sensitivity of cancer cells to therapy. There is a group of patients in who, despite an excellent prognosis, good initial response to treatment and lack of risk factors, relapse.

The implementation of this project will result in an in-depth understanding of the immune system profile of pediatric patients diagnosed with acute lymphoblastic leukemia, which could contribute to the development of a more effective diagnosis, prognosis and monitoring of the disease, along with new therapeutic targets. Perhaps a better approach to maintaining remission in patients with acute lymphoblastic leukemia is to stimulate and regulate the patients' immune systems instead of burdening them with additional doses of side-effect bearing chemotherapy?