Allogeneic haematopoietic stem cell transplantation (HSCT) is a curative treatment of many haematopoietic proliferative diseases. The objective of this study is to conduct a complex analysis of selected NK cell receptors and their ligands in HSCT recipients in order to determine an immunogenetic, epigenetic, and proteomic risk and protective profile of patients in the context of complications such as viral infections (cytomegalovirus reactivation, CMV) and acute graft-versus-host disease (GvHD).

Human leukocyte antigens (HLA) constitute one of the most important elements of the immune system. They participate in the recognition of antigenic structures between transplant donor and recipient. Among the histocompatibility antigens there are classical class I antigens (HLA-A, -B and -C) and non-classical HLA class I molecules, such as HLA-E, -F and -G, and MICA and MICB. HLA class II antigens include HLA-DP, -DQ and -DR. Typing for classical HLA *loci* enables precise donor selection and has an may improve the outcome of allogeneic HSCT.

Individual, genetically determined, differences in the expression of non-classical HLA class I molecules are thought to affect the level of gene transcription, and may be an important element of donor-recipient matching for transplantation. Monitoring the presence of immune system cells after transplantation, including NK cells, allows to track the kinetics of haematological recovery. Disturbances in the normal profile of haematological reconstitution affect the development of post-transplant complications, such as an increased risk for viral reactivation or the development of an acute or chronic form of graft-versus-host disease (GvHD). The most common infectious complication is caused by the cytomegalovirus (CMV). CMV reactivation can be detected and treated before the CMV disease develops. The most common cause of CMV infection is reactivation of the latent (dormant) virus in a seropositive patient (having anti-CMV antibodies), or the transmission of cytomegalovirus from a seropositive donor to a seronegative recipient. Therefore, the optimal situation is when the serological state of the donor and recipient is identical. Number and type of the cells in the graft may affect the fate of haematological reconstitution after transplantation. Transplant material can be obtained from peripheral blood or bone marrow of the donor. Another important factor is the choice of the pre-transplant conditioning regimen either with increased or reduced intensity. This treatment affects the risk of relapse after transplantation, and may increase survival time, but may also be toxic for the recipient. The evaluation of the effectiveness of the therapeutic strength of the treatment and the achievement of a positive anti-leukaemic effect exerted by the donor's cells is evidenced by the lack of a minimal residual disease and the presence of the full post-transplant chimerism evaluated in the patient after transplantation.

NK cells are a population of cells that are the first to appear after transplantation. They play an important role in the response against cancer and cells infected with microorganisms, e.g. viruses. NK cells are involved in innate and adaptive immune responses. Their activation is determined by signals from inhibitory and activating receptors stimulated by ligands present on the surface of their target cells. The main regulators of NK cell activity are the class I histocompatibility antigens, which enable NK cells to recognize self healthy cells. Lowering the expression of HLA class I molecules on tumour or virus-infected cells allows the NK cells to respond against them. In order for the target cell to be killed by the NK cell, it must not only have a reduced expression of HLA class I molecules (or none at all), whereas the NK cell must receive an appropriate signal from its own activating receptors. Activation of NK cells depends on the balance between signalling pathways stimulated by activating and inhibitory receptors.

Therefore, the study of genetic variation of non-classical HLA and their receptors including natural cytotoxicity (NCR) receptors, lectin-like receptors (CD94/NKG2), immunoglobulin-like transcripts (ILT), and the determination of serum levels of soluble forms of HLA-E, HLA-F, HLA-G, MICA / B will allow a comparative analysis of groups of patients differentiated in term of post-transplant complications, such as CMV infection and GvHD. In addition, the aim will be to show whether the dominance of inhibitory / activating receptors on NK cells in combination with the corresponding ligands may interfere with the function of NK cells and promote progression of the disease process in patients after allogeneic HSCT. We will also investigate whether expression of individual determinants on the NK cells may change as a result of viral infections, or whether a set of characteristic antigens of a given malignant cell differs in the patient after 30 and 90 days after transplantation depending on the donor selection, therapeutic conditioning, type of post-transplant complications.