Bone Sarcomas (BS) are a rare group of heterogeneous mesenchymal malignant tumors derived from connective tissues. In the second place in terms of frequency of bone sarcoma in adults is chondrosarcoma (ChSA). Disease affects not only adult population but also children. The 5-year survival is still not satisfactory, and for adult averages at 50-60%. The median survival time in patients with metastatic ChSA is poorer (approximately 12 months), and only a small subgroup of patients may achieve long term survival. **Therefore there is a need for new diagnostic and therapeutic options for this group of patients.**

In recent years there has been a dynamic development of knowledge about the immunology of malignant tumors. Scientific research shows that during the development of cancer, the number of mutations in tumor cells accumulates, moreover, antigens derived from the products of mutant tumor-specific genes are the main source of tumor antigens (neoantigens) involved in the immune response. In comparison with unmutated autoantigens, neoantigens have a higher antigenicity, and thus may be an ideal therapeutic target. The importance of neoantigens in the immune response has been well understood, and the development of these studies has enabled the registration of new, active anticancer drugs acting through the immune system. The use of immunological therapies has improved the prognosis of patients with various cancers and is a breakthrough in oncological treatment. **However, new therapies are not used in patients with ChSA due to the limited amount of information on the immunological characteristics of sarcomas.**

In the ChSA a wide variety of molecular genomic abnormalities and it is a disorder "complex genomic profiles." In the presented project, we hypothesize that sarcomas with complex molecular disturbances have a significant amount of neoantigens, and thus may be sensitive to drugs targeting immune response. In these tumors, the immune response to therapy with "checkpoint" inhibitors is higher in cases with a higher mutation load. The research on mechanisms of immune response in ChSA is one of the goals of this project, and changes in the immunological profile of tumors will also be investigated. Thus, the **immunological classification system of ChSA based on the expression of immunological markers and genetic changes conditioning the immune response is to be developed.**

It is planned to pathologically assess immunological markers and immune-infiltrates in the tumor microenvironment as well as to undertake genetic tests. We plan to correlate these results with clinical-pathological status and patient prognosis after therapy as well as intervals between primary tumor surgery and recurrence. Clinical outcomes will be correlated with expression patterns of immune markers, that might help to predict tumors responsive to immunotherapeutic agents in the future.

Such a project can be performed in only a few centers worldwide, and our center with selected partners thereby further assures the full feasibility of this study. The study will be based upon an existing large clinical database of sarcoma patients, treated at three well-known cancer research centers for sarcomas Maria Skłodowska-Curie Institute – Oncological Center, Rizzoli Orthopaedic Institute, and Istituto Nazionale Tumori from Italy. Since January 2017, Maria Skłodowska-Curie Institute and Rizzoli Institute are European referral centres for sarcomas being a Partner of *EURACAN Network*: European network for Rare adult solid Cancer (http://euracan.ern-net.eu/network/). All institution are the leading centers for sarcoma treatment with many new adult patients receiving therapy each year, and are the pioneers for studying molecular markers of sarcoma.

We assume that we shall describe, for the first time, the immunological characteristics of ChSA and their relationship to patient outcomes, clinical-pathological features, tumor subtypes and genetic alterations thereby allowing a new classification of sarcomas to be developed. **The results of this project can be a breakthrough for further research based on classifying chondrosarcomas as well as facilitating possible immunotherapy for these tumors. Such a system may help in qualifying patients for appropriate types of clinical trials and future therapies.**