

Cancer cells are characterized by uncontrolled divisions and resistance to programmed cell death. In recent times, a population of cancer cells that are very resistant to therapy, which are capable of self-renewal, has been discovered. As this subpopulation has properties similar to stem cells, those cells were called cancer stem-like cells. They are mostly suspected of metastasis formation and resistance to multiple treatment strategies. These cells have a quantity of systems that remove therapeutics given during treatment from the cell environment. Activation of these systems leads to strong chemo-resistance. Moreover, cancer stem-like cells have activated systems of DNA damage repair. In consequence they are resistant to radiotherapy and photodynamic therapy. Main goal of those therapies is to implement damages in DNA, thus cell with activated DNA repair systems is resistant to those therapies. Cancer stem-like cells occur in distinct types of cancer. Due to the high resistance to different types of therapy and the ability to migrate and self-renewal, these cells are suspected of being the main cause of cancer recurrence and metastasis. The appearance of this population of cells is believed to worsens patient prognosis. However, there are still no solid evidence of association between presence of cancer stem-like cells in blood and elevated metastasis risk.

Breast cancer is the most common malignancy in women. It accounts for about 23% of all cases of malignant tumors among women in Poland. Resistance to treatment appears even in 20% of relapses and metastases. The results of the latest research conducted on breast cancer cell lines suggest that resistance to treatment is strongly associated with the emergence of a population of cancer stem-like cells. The most common subtype of breast cancer is luminal breast cancer – with expression of estrogen receptor (ER+). In this subtype main estrogen and its receptor are main causes of malignancy. This subtype is treated with antiestrogen treatment for inhibition of estrogen effects in tumor. The most malignant subtype of breast cancer is the basal breast cancer. In this tumor often appears resistance to chemotherapy and raise in invasiveness of the tumor, which in consequence drives to metastasis. The basal breast cancer consists of the least diverse cells compared to the other biological subtypes of breast cancer.

Our study is aimed for identification and enumeration of circulating cancer stem-like cells in different subtypes of breast cancer. We hope to evaluate the true role of this cancer cells subpopulation in breast cancer development: especially in metastasis formation and resistance. We hope to create a repetitive assay for identification of those cells in blood – for non-invasive tests.