Analysis of interactions between cancer cells and Tumor Educated Platelets

Ovarian cancer is the leading cause of death among gynaecologic patients and the fourth most common cause of death in cancer patients. Mortality rate of ovarian cancer is more than 15% higher in Poland than the average for European Union countries. Only in 2012, the number of deaths due to this disease reached 2 692, and 4 445 new cases were reported.

In ovarian cancer, the standard test used to diagnose and assess the effectiveness of therapy is based on the level of CA-125 marker. Although CA-125 is helpful in detecting the disease, it lacks specificity and sensitivity. Not all ovarian cancer patients have a high level of CA-125, and the increase of this marker is also associated with conditions such as pregnancy, endometriosis and cirrhosis. In addition, CA-125 marker changes are not dynamic: CA-125 level does not change quickly along with the loss of therapy effectiveness. This does not allow a reliable assessment of response to treatment, nor does it detect residual disease.

TEPs (Tumor Educated Platelets) are the effect of cancer and healthy cell interaction. TEPs change their behaviour under the influence of signals sent by the tumor. Their analysis has a great potential of becoming a new, effective diagnostic tool. Patients' blood collected during routine procedure, called liquid biopsy, is a revolutionary type of a test that could allow analysis of the RNA profile of platelets changed under tumor influence.

For a TEPs-based liquid biopsy to be an effective diagnostic tool in ovarian cancer, it is necessary to study the molecular background of the interaction between cancer cells and platelets. Consequently, a series of laboratory experiments has been planned, involving co-cultures of ovarian cancer cell lines with TEPs. Platelets exposed to contact with cancer cells should change their behaviour, which will be reflected by their altered content (the presence of other RNA molecules). These changes will be examined using innovative technology, which enables RNA sequencing at the level of individual cells. This breakthrough approach will allow simultaneous, digital reading of thousands or even millions of RNA sequence fragments. Such analysis will explain the interaction of cells with platelets with in unprecedented detail.

The results of project will aid personalized medicine. The true potential of TEPs as a biomarker will be revealed with a deeper understanding of the process of platelet education occurring during cancer progression. In the future, the analysis of liquid biopsies collected at each patient visit will allow to dynamically track the progress of cancer, and the latest technological developments will allow faster and more accurate analysis of liquid biopsy material. In the long-term, project results could contribute to lowering mortality among patients and increasing their comfort of life during therapy. Obtained results may also prove useful in other types of cancer.