The use of non-coding RNAs and nanotechnology in regulation of the expression of selected proteins of the extracellular matrix of glioblastoma and breast cancer

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Cancers are often referred to as the fatal diseases of the 21st century. The global incidence and mortality from this type of disorders are continuously increasing. The highly problematic ones, taking into account the effectiveness of the treatment, are malignant tumors of the brain and breast. Grade IV glioma (GBM) and triple negative breast cancer (TNBC) are tumors exhibiting frequent recurrences. Difficulties related to the surgical extraction of the entire affected GBM mass, as well as the inability to use hormone therapy in the case of TNBC, indicate that new therapeutic approaches are still being sought.

One of the most extensively developed therapeutic approach is based on RNA interference (RNAi), which enables the manipulation of gene expression levels. Its mechanizm has been studied so broadly that there are already available drugs on the market, containing siRNA as an active ingredient. Therefore, the biggest challenge up to date, is to select the appropriate therapeutic targets that allow for distinguishing neoplastic tissues from the health ones, which are also crucial for tumor progression, followed by establishment of optima methods of therapeutics delivery to the affected area. Taking into account, how disadvantageous for the patient the spreading of tumor mass is, targeting the factors that are related to tumor cell migration appears to be highly auspicious treatment approach.

The main goal of my research approach was to determine the involvement of the extracellular matrix (ECM) in the neoplastic process. In the doctoral dissertation, I presented the impact of non-coding RNAs on the level of key proteins for ECM: tenascin-C and syndecan-2. I also studied the changes associated with application of this approach in glioblastoma and breast cancer cells, with particular emphasis on the processes of migration, adhesion and metastasis. Moreover, I proposed the use of modern nanotechnology tools that enable the delivery of regulatory RNA to cells, as well as I preliminarily characterized and verified the use of ECM in potential cancer therapy.