

Project goal

A significant advancement in cancer immunotherapy rekindled the hopes of the medical community for curing therapeutically challenging cancers. Among the developed strategies against cancer, there has been made major improvement in the use of chimeric antigen receptor (CAR)-equipped immune cells, which selectively fight and kill cancer cells. However, despite undoubted success in hematological malignancies, CAR-based therapy has limited effects on solid tumors, such as glioblastoma. Our main goal is to design, generate, and evaluate a novel system that increases the efficiency and safety of CAR-based therapy against solid tumors.

Description of research

We propose using CAR-equipped immune cells to target both the tumor cells and the tumor microenvironment supporting its progression. Specifically, we plan to introduce CAR molecule into a logic gate, functioning as a “switch” turning on and off the CAR. When CAR is switched on, CAR-equipped immune cells will eliminate the tumor and its microenvironment. Thus, like a cellular scalpel, it will eradicate the source of potential cancer recurrence. Then the CAR will switch off, which ensures both efficacy and safety of this therapy. Importantly, such logic-gated systems are currently trending in current research, which illustrates the rising hopes for the application of this solution in cancer therapy.

Reasons for attempting a research topic

Undeniably, medicine has undergone a significant transformation in recent years in the field of cancer treatment, from radio- and chemotherapy to more personalized approaches. Such personalized strategy against cancer worthy of special attention, includes the use of **therapy with chimeric antigen receptor (CAR)**-equipped immune cells. CARs are very specific receptors allowing cells equipped with them to recognize a molecule present on the surface of other cells. Those distinguishing molecules – markers, help in recognizing cancer by immune cells. After the recognition of the marker, CAR stimulates the immune cell to kill such a target. CAR-equipped cell activity can be compared to molecular scalpel eliminating the tumor. However, this technology is still in desperate need for improvement in real life, especially regarding solid tumor treatment. Therefore, it is necessary to proceed with advancement to increase the safety and efficiency of CAR-based therapy.

Substantial results expected

The proposed project has an innovative character and the potential to change current procedures for treating cancer patients. Therefore, the gathered information may contribute to enhancing the efficacy of glioblastoma therapy, and also it could be transferred to other solid tumors. Due to the high level of elasticity enabling us to suit the therapy for different tumors, this project has significant chances to enter clinical trials. However, the application of our system is not limited to solid tumors only. Our studies will also contribute to the increase in knowledge in medicine and immunooncology.