

Cancer is a major public health problem worldwide and the second leading cause of death after heart diseases. Most of the currently used anti-cancer therapies are based on drugs that are very toxic not only for cancer cells but also for the healthy ones, which leads to many undesirable side effects affecting different tissues and organs. Another great obstacle that interferes with the successful treatment of cancer is the fact that only up to 5% of the drug reaches the tumour, while the 95% goes to healthy tissues causing side effects (or is immediately removed from the body). The reason for this problem is the lack of properly developed blood vessels in quickly growing tumour mass, which leads to weaker blood and oxygen supply and, as a consequence, worse access of a drug to centrally located parts of cancer.

These problems with limited effectiveness of standard cancer therapy are a constant inspiration for the scientists to develop new methods of treatment aimed to overcome this issues. In our lab we have discovered the possibility of using immune system cells as carriers of the iron storage protein nanocage (inside of which we can close anti-tumour drugs) and delivered it to the tumour (also to the regions with weaker blood supply, as we know, that our cells come out of the blood vessels and migrate inside the cancer tissue, where they stay for several days and can release the nanocage with drug). However, the process of the uptake of this protein nanocage, its fate inside the immune cell and the reason why these cells transfer the protein nanocage to cancer cells is still not clear and needs to be studied in various oxygen conditions (standard and with low oxygen level) before it can be used in a therapy.

The general aims of our project are:

- to investigate the reason of protein nanocage internalisation by immune cells and its fate in these cells in low oxygen and standard conditions,
- to verify the protective role of this protein nanocage transferred from immune cells to cancer cells against oxidative stress (in low oxygen conditions).

Finding the answers to these research questions will be significant from both scientific and practical point of view. The results of the experiments planned within this project will widen the basic knowledge about the role of selected immune cells and our protein nanocage in the oxidative stress and in tumour environment characterised by low oxygen level. Moreover, it will bring us one step closer to the development of a new method of anti-cancer drug delivery.