

Hot taste of chili peppers, an effect of compound named capsaicin, is well known to everybody. The burning sensation, however, is caused by the activation of ion channel called TRPV1, which is the receptor of capsaicin. Nevertheless, the capsaicin receptor is not only present in our taste buds but also on the surface of our immune cells such as lymphocytes T. What is the role of the capsaicin receptor in immune cells? Is it used by the T cell to “taste” the surrounding environment? And if so, how then the T cells would behave in the surrounding that activates or blocks the TRPV1 receptor? These are the questions we want to answer in our research project. In addition to capsaicin receptor, our study will be also extended by two other members of TRP ion channels, namely TRPV2 and TRPM5.

Our research will be conducted on lymphocytes T, which are the cells that defend us from pathogens attack but also from cancer development. Our main objective is to determine the role of TRPV1, TRPV2 and TRPM5 in the immune function of T cells. Activation of lymphocytes T, which is in the other word a process of the T cell mobilization to fight, is influenced by several factors. One of them is elevated temperature (fever) which activates the T cells. The inhibition of T cell function, in turn, occurs at low (acidic) pH, which is often characteristic for tumor microenvironment. Interestingly, it is also known that TRPV1 and TRPV2 possess thermosensing ability while both TRPV1 and TRPM5 are capable of sensing H⁺ ions, responsible for low pH values. Therefore, we will examine whether TRP channels are involved in informing the T cells about surrounding environment f.e. temperature and pH conditions. We will determine if activation and blocking of TRP channels can influence T cell activation process. If we can prove that TRP channels are thermometers and pH-meters of T cells, modulating their behavior, maybe we would be able to overcome blocking of T cell response in the acidic tumor environment or allowed for fever-free mobilization of T cells.

Understanding the role of the TRP channels in the functioning of T cells will not only expand our knowledge about immune system but also can open new way for immunomodulation, which could be implemented in the treatment of autoimmune diseases and cancer. It is worth to remember that in the arena of life cells are only actors playing a role under guidance of the director – the environment. That is why research on the cell-environment crosstalk is an exciting field of research.