

DESCRIPTION FOR THE GENERAL PUBLIC

G protein-coupled receptor (GPCR) are one of the key proteins for humans and are present in nearly every cell of our body. To communicate, exchange information among themselves and monitor their environment cells have to use specific molecules such as neurotransmitters. Signaling molecules bind with specialized receptor proteins reside within the plasma membrane, named G protein-coupled receptors, which transmit information into the cell. Depending on the bound molecule, receptor can activate various G proteins bound to the membrane on the cytoplasmic side. Active G protein may activate specific effector proteins to start a signaling cascade of changes inside the cell.

Despite several decades of research we are still far from full explanation of how receptors transmit the signal to appropriate G protein and what is the role in this processes membrane lipids. Many studies confirmed that the organization of cellular membrane plays an important role in the process of signal transmission from the outside to the inside of the cell. It is postulated that formation of stable structures within the cell membrane, which are a kind of platforms to transmit the signal, can concentrate receptors, G proteins and effector protein. This project aim is to understand the interplay between membranes, G proteins and dopamine receptors.

For this purpose, complementary, advanced and sensitive techniques will be used, including: fluorescence recovery after photobleaching (FRAP) and fluorescence resonance energy transfer (FRET) detected by lifetime imaging microscopy (FLIM), dot blot, isothermal titration calorimetry (ITC), differential scanning calorimetry (DSC), electron paramagnetic resonance (EPR) and fluorescence spectroscopy. These techniques are excellent tool which give a deep insight into processes occurring in living organisms at molecular level.

The knowledge concerning the molecular details of such important processes like signal transmission is fundamental because dysfunctions of the dopaminergic system cause severe disorders (Parkinson disease, schizophrenia, depression). The better understanding of signaling pathways should definitely help in designing new, more selective and safe drugs. It is highly probable that the mechanisms we described for the dopamine receptors function also in case of the other members of GPCR family – that would make our results even more important.