Anxiety disorders are the most common group of psychiatric cases. It is estimated they appear in one-third of the population. Within the group of people with suicide attempts, 70% were diagnosed with some anxiety disorders. This group of conditions occurs both in adults and children and might be associated with trauma as well as excessive stress. Unfortunately, according to the estimations, only a half of cases are being recognized and only a half of patients receives drug treatment, which is not much, in comparison to other mental disorders. It is worth mentioning that available therapies concentrate on observable symptoms treatment, rather than neuronal mechanisms, which are not well established yet. Therefore, further research in the area is needed to explore neuronal structures and circuits involved in stress response and control of anxiety disorders.

Nerve growth factor (NGF) is a neurotrophin discovered as an important element in both sensory and sympathetic neurons growth, survival, and differentiation. However, recent studies have found more broaden and sophisticated roles of NGF than it was thought previously. It was reported that the level of NGF in the bloodstream and brain varies significantly in different conditions such as stress, anxiety disorders, and aggressiveness. Yet, precise NGF function in stress and anxiety control remains unknown.

An important element of the brain circuit controlling anxiety and emotions is ventral hippocampus (vHipp). Recent findings suggested the existence of anxiety cells in ventral, but not dorsal part of hippocampus. Moreover, vHipp is highly innervated by neural fibres expressing TrkA, high affinity NGF receptor, yet the origin of these axons remains undiscovered.

vHipp is densely innervated by interpeduncular nucleus (IPN), a midbrain structure involved in novelty signalling and anxiety control. It also plays a key role in the control of unpleasant symptoms of alcohol and drugs of abuse cessations. Moreover, IPN is involved in control of stress response. Importantly, IPN neurons express mRNA for TrkA receptors, however, precise mechanisms of NGF signalling in this structure remain unclear.

The aim of the current project is to verify the sensitivity of IPN neurons to NGF and identify the source of NGF in the area of IPN. Furthermore, implementation of the project will allow for characterization of IPN neurons innervating vHipp, and description of their projections to different brain structures, which will allow for the assignment of this IPN neuronal population to specific functional brain circuits. Planned electrophysiological, morphological, and tract-tracing studies will allow untangling complicated mechanisms laying behind anxiety signalling and the possible role of vHipp-IPN circuit and NGF in this process.