

DESCRIPTION FOR THE GENERAL PUBLIC

State the objective of the project

The aim of the project is synthesis and biological evaluation of new compounds that could interact with more than one biological target. Biological targets are ion channels, receptors or amine transporters that are involved in the proper functioning of the central nervous system CNS. Comparing the currently available drugs, these new compounds could be more effective and safe in the treatment of epilepsy, depression, anxiety, or neuropathic pain.

The research to be carried out

In this project, by combining the important structural fragments of the well-known antiepileptics (AEDs) – ethosuximide (pyrrolidine-2,5-dione), phenytoin (imidazolidine-2,4-dione), with structural elements of the newer AEDs e.g. tiagabine and zonisamide we will obtain new hybrid compounds. Hybrids like that can interact with more than one biological target, i.e. ion channels, amine transporters or receptors occurring in the central nervous system and hence display multidirectional activity. The designed hybrid compounds will be obtained in a multistep chemical synthesis and tested in the *in vitro* (outside the organism, on the cell lines) pharmacological studies to determine whether and how strong they interact with the selected biological targets. The most active compounds at this stage of the study will be evaluated in the safety and structural stability tests. To verify their effectiveness in aforementioned central nervous system disorders, the selected hybrid compounds will be tested *in vivo*, using laboratory animals (mice or rats).

Present reasons for choosing the research topic

The central nervous system diseases e.g. epilepsy, depression, anxiety, or neuropathic pain affect millions of people around the world. They are not only a significant health problem but also serious economic and social issue. These diseases are complex and caused by the dysfunctions of multiple biological structures. Therefore they require complex treatment, e. g. the administration of a drug cocktail or a multicomponent drug. The innovative approach is treatment with hybrid compounds. Hybrid compounds, combining important structural fragments of known medicines with the proven biological efficacy, can interact simultaneously with several biological targets. Therefore they might be more effective and safer in the treatment of complex diseases of the central nervous system.

The undertaken research topic concerns the development of the new hybrid compounds with the multifunctional activity mechanism. These compounds will be designed to act more effectively and safe in the therapy of the diseases with complex pathogenesis such as epilepsy, depression, anxiety, or neuropathic pain.