BIOCHEMICAL BASES OF SELECTIVE SEROTONIN REUPTAKE INHIBITORS EFFECTS

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Introduction. The last years statistics reveals a steady increase in the number of patients suffering from depression. Depression development leads structural, morphological and mediator changes, which are mediated by cerebrovascular disorders, traumatic, infectious or toxic effects, as well as provoked by long-term intake of drugs with maintenance therapy. Today, selective serotonin reuptake inhibitors (SSRIs) are most often prescribed as antidepressants.

Aim. The aim of our investigation was to find and reviewed informational scientific resources considering the mechanisms of SSRIs action.

Materials and methods. Information resources search was conducted in PubMed and ScienceDirect textual databases of medical and biological publications through November 2021. The following search terms were used: serotonin, serotonin receptors, SSRIs.

Results and discussion. Serotonin (5-hydroxytryptamine) is a neurotransmitter, which is synthesized from essential amino acid tryptophan. There are seven types of serotonin receptors in brain pointed 5HT1 and with the help of numbers and letters (i.e. 5-HT1A, 5-HT1B, 5-HT4, and 5-HT7). Serotonin is involved in the regulation of emotional behavior, motor activity, sleep and eating behavior. It is believed that insufficient activity of the serotonergic neurotransmitter system underlies anxiety and depression. The greatest pathogenetic significance in the correction of emotional disorders and the development of an antidepressant effect is the serotonin binding to 5-HT1 receptors. The generation of excitatory postsynaptic potential in 5-HT2 and 5-HT3 receptors is accompanied by the development of adverse effects in the form of sleep disturbances, agitation, nausea, and dizziness. Generally, it is thought that SSRIs work by increasing serotonin levels in the brain via tree sequential effects. At the first stage, inhibition of serotonin reuptake occurs in both the central and peripheral nervous systems. At the second stage, the blocking function of 5-HT1A receptors located in the somatodendritic part of the midbrain neurons is disrupted. In the third stage, serotonergic neurons are disinhibited and serotonin is released from axons leading to various structures in the brain.

Conclusions. Thus, SSRI antidepressants, which act by increasing levels of serotonin within the brain, are currently some of the most commonly prescribed medications.

CRISPR/CAS9 – GENOME-EDITING TECHNOLOGY

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Introduction. On October 7, 2020, the Nobel Prize in Chemistry was awarded to researchers Emmanuel Charpentier and Jennifer A. Dudney “for the method of genome editing”. The

CRISPR/Cas9 “genetic scissors” they discovered are one of the most important scientific achievements of this century. This discovery can dramatically change agriculture and medicine and even help to treat hereditary diseases and some cancers.

Aim. The purpose of current work was to study and discuss the modern technology for genome editing in many organisms – CRISPR/Cas9.

Materials and methods. Formulating the research questions and objectives, searching scientific publications, screening for inclusion, assessing the quality of studies, extracting data, and analyzing data.

Results and discussion. CRISPRs (Clustered Regularly Interspaced Short Palindromic Repeats) are short palindromic repeats in regular clusters, in another words – groups of repetitive DNA sequences. This technology for editing genomes of higher organisms, based on the immune system of bacteria. Cas are CRISPR-associated proteins that cut out viral DNA. There are 93 known such proteins, one of which is Cas9. CRISPR/Cas9 is a powerful tool that has made gene editing faster, more accurate, cheaper and easier. To edit the genome with “genetic scissors”, an artificial RNA guide is created, which corresponds to the DNA code in the place where the cut is to be made. Cas9 protein forms a complex with the targeting RNA, which transports the “scissors” to the place in the genome where the cut will be made. After that there are two variants of events. The first one is to allow the cell to repair the cut itself in the polynucleotide chain. However, in most cases this would disable the function of the gene being edited. Another option is when researchers want to insert, correct, or edit a gene. In order to do this, a small DNA template is created, which is then used to restore the cut in the polynucleotide chain, and, accordingly, the code in the genome will change. Also, it is possible do multiplex editing of several wrong genes at once. To do this, it is enough to introduce the Cas9 protein and several different RNA guides.

Conclusions. Relative simplicity of the CRISPR/Cas9 technology made it available to researchers around the world and in a wide variety of fields. This discovery inspired hundreds of scientists to explore the potential of other CRISPR-related systems such as Cas12a and Cas13, including for the diagnosis and treatment of COVID-19.

C-JUN N-TERMINAL KINASE INHIBITORS AS POTENTIAL DRUGS

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Introduction. c-Jun N-terminal kinase (JNK) signaling regulates both cancer cell apoptosis and survival. Emerging evidence show that JNK promoted tumour progression is involved in various cancers that include human pancreatic-, lung-, and breast cancer. The pro-survival JNK oncoprotein functions in a cell context- and cell type-specific manner to affect signal pathways that modulate tumour initiation, proliferation, and migration. JNK is therefore considered a potential oncogenic target for cancer therapy. The deregulation of these kinases is shown to be involved in human diseases, such as cancer, immune diseases and neurodegenerative disorders. The realization of the