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

therapeutic potential of the inhibition of JNKs led to a thorough search for small-molecule inhibitors first for research purposes, but later also for therapeutic applications.

Aim. The aim of the study was to collect the information about chemical structure and biochemical effects of JNK inhibitors and their pharmacological activities.

Materials and methods. In order to achieve this goal, an information search was conducted in the materials of scientific articles.

Results and discussion. Due to the important role of JNK in the cancer development, designing effective and specific JNK inhibitors is a very active filed of research in different academic and industrial laboratories in the world. Currently, the clinical success of selective kinase inhibitors, such as imatinib and erlotinib, as therapeutic agents for several human cancers has prompted substantial interest in the development and clinical testing of such inhibitors for a wide variety of malignancies. AS601245 is a cell-permeable JNK inhibitor that shows promising anticancer effects in colon cancer and T cell acute lymphoblastic leukaemia. AS602801 is cytotoxic against CSCs derived from human pancreatic cancer, ovarian cancer, and glioblastoma. Hepatic ischemia/reperfusion (I/R), which is characterized by severe inflammation and cell death, causes significant liver damage and hepatic cancer.

Conclusions. JNK signaling is a crucial oncogenic target that raises many researcher's interest. Uncovering highly efficient selective JNK inhibitors is a hot topic of the last decade. Currently, some selective JNK inhibitors have been developed; however, more clinical studies of these inhibitors should be tested. Moreover, clinical studies of JNK inhibitors should determine which JNK inhibitor is most effective against cancer therapy.

CRISPR –HACKING THE BIOLOGICAL HARD DRIVE

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Introduction. In 2012, researchers identified a new markers-free gene editing mechanism. This exciting new technology, CRISPR, has revolutionised the industry and academic research. CRISPR allows for a highly efficient and precise gene editing process. In humans, the technology is already being used successfully to manipulate immune cells, reprogramming them to recognise cancer cells. Several such cell therapy approaches are either being planned or currently tested in US clinical trials. Furthermore, CRISPR technology could be used to cure genetic diseases at an embryonic stage. Recent published research in China has demonstrated successful use of CRISPR gene editing on human embryonic stem cells. The treatment of embryonic stem cells raises significant legal and ethical questions; a number of countries prevent such procedures by law.

Aim. The main goal is to analize the procedure of gene editing and to discuss its medical and pharmaceutical applications.

Materials and methods. In order to achieve this goal, an information search was conducted in the materials of scientific articles.