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ФАКУЛЬТЕТ БИОЛОГИИ И БИОТЕХНОЛОГИИ

V ХАЛЫҚАРАЛЫҚ ФАРАБИ ОҚУЛАРЫ

Алматы, Қазақстан, 2018 жыл, 10-11 сәуір

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miRNAS AND *POU5F1, SOX2* GENES AS POTENTIAL PARTICLES FOR INCORPORATION INTO POLYSACCHARIDE

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POU5F1 and *SOX2* genes encode the transcription factors that are involved in oncogenesis, including the development of breast cancer. In particular, *SOX2* inhibits cell proliferation and metastasis, promotes apoptosis. For delivery to the tumor *POU5F1* and *SOX2* genes included in negatively charged plasmid mixture, used in the positively charged cationic polysaccharide self-organizing into nanosized particles, named as CPEPS-OS-miR nanoparticles, which can be applied in oncological medicine. In these particles included miR302-367, which can bind to mRNA genes. To test the effectiveness of microRNAs, we detected microRNAs that can suppress the expression of *POU5F1* and *SOX2* genes.

The nucleotide sequences of mRNAs of human genes were downloaded from NCBI GenBank (http://www.ncbi.nlm.nih.gov). Nucleotide sequences of human 2565 miRNAs were downloaded from the miRBase database (http://mirbase.org). miRNAs binding sites were predicted using the MirTarget program.

There are ten miRNAs bind with mRNAs of *PO5F1* gene from 512 nt to 625 nt position with binding energy of -91 kJ/mole to -119 kJ/mole in 5'UTR, another cluster of miRNAs with mRNAs of *PO5F1* have been in position from 1000 nt to 1433 nt in 5'UTR. Notably, miRNAs with mRNAs of *SOX2* gene have binding sites in 3'UTR, and have positions from 1672 nt to 1681 nt, creating a cluster for eight different miRNAs with binding energy of -98 kJ/mole to -108 kJ/mole, and they have score from 85% to 89%. The obtained results indicate that mRNAs of *POU5F1* and *SOX2* genes can bind to miRNAs in different degrees. The largest number of miRNAs binding sites was shown for mRNA of *SOX2* gene, than for *POU5F1*. miR302-367 do not interact with mRNAs of *POU5F1* and *SOX2* genes. Based on the obtained data, miRNAs and mRNAs of *POU5F1* and *SOX2* genes associations have been identified, that allows them to be used as potential particles for incorporation into polysaccharide for further use in cancer medicine.

Scientific adviser: Doctor of biological sciences, Professor A.T. Ivashchenko

OH, MY GUT! THE INTERACTION OF miRNAs WITH mRNAs OF COLON CANCER GENES

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Understanding of genetic events driving the pathogenesis of colon cancer is of critical importance to devise new strategies to treat this malignancy. In recent years actively studied the interaction of miRNA with mRNA of genes, responsible for the development of cancer.

miRNA play an important role in carcinogenesis. Definition of specific miRNAs and their target genes, participating in carcinogenesis allows us to better understand the mechanism of their regulation.

Searching of miRNA's target genes was performed by MirTarget software, created in our laboratory. This software defines beginning of miRNA and mRNA binding sites; localization of binding sites in 5'UTR, CDS, 3'UTR; free energy of hybridization and scheme of miRNA-mRNA nucleotides interaction. For analysis it was selected 157 genes from Genbank (http://www.ncbi.nlm.nih.gov/), most frequently involved in the development of colon cancer.

Identified mRNA of *AATK, HDAC4, KDM1A, NFE2L2* and *RXRA* genes, having fully complementary binding sites with miRNA. The mRNA of *AATK* gene has two binding sites of miR-17-39023-3p in CDS with energy range from -134 kJ/mole to -142 kJ/mole and value ΔG/ΔGm from 94% to 100%. The mRNA of *NFE2L2* has multiple binding sites of miR-1-155-3p, miR-11-28656-5p, miR-19-21199-3p and miR-2-3313-3p located consistently through one nucleotide in 5'UTR, with ΔG value from -115 kJ/mole to -144 kJ/mole.

PRKG1 gene has the largest number of clustered binding sites (83), with ΔG value varying from -102 kJ/mole to -149 kJ/mole at ΔG/ΔGm value from 87% to 95%.

miR-15-36862-3p and miR-10-29282-3p have 23 homological binding sites in 3'UTR of *UMPS* gene, located consistently through two nucleotides, with ΔG value from -104 kJ/mole to -108 kJ/mole. The presence of such multiple binding sites indicates strong dependence of gene expression from each of these miRNAs. *PLEC* gene has thirty three sites, with ΔG value from -108 kJ/mole to -132 kJ/mole. The obtained

results show interaction of considered mRNAs with miRNA for statement, that this miRNA could suppress an expression of these genes with increased presumption.

Scientific adviser: doctor of biological science, Professor Ivashchenko A.T.

PRODUCTION OF A COMPOSITE MATERIAL BASED ON THE BC FILM WITH IMMOBILIZED *B. SUBTILIS* P-2 CELLS

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Successful immobilization of bacteria and enzymes on the BC with the preservation and even increasing in their physiological activity served as the basis for the present study.

According to the obtained data, the *B. subtilis* P-2 strain is best suited for this purpose. These types of activity of the strain can impart future composites both to the properties of the antibiotic and to the properties of the enzyme preparation.

There are two main methodological methods for including additional components in the BC. In one of them, the reinforcing material added to the BC during its synthesis; thereby this inserted component incorporated into the film and then becomes part of the polymer structure. However, since the *B. subtilis* P-2 strain has antibacterial and proteolytic activity, expected that it inhibit the development of the BC producer strain. Therefore, another methodical technique used, namely, the inclusion of cells *B. subtilis* P-2 carried out by their joint aggregation with an already finished BC film.

The nature of changes in the sorption capacity values indicate a gradual increase in the biomass of *B.subtilis* P-2 cells on the gel film of the BC already starting from the 2-hour contact, which leads to a decrease in the number of suspended cells. By the 24 hours of the experiment, the optical density of the suspension has reached the plateau, and no further reduction occurs. Saturation of the BC of the film with cells of B. subtilis P-2 occurs. The subsequent increase in the contact time of the suspension of bacteria with the carrier up to 96 hours did not lead to an increase in the number of attached cells. Based on the data obtained, concluded that 24 hours is the optimal time for immobilization of *B. subtilis* P-2 cells on the gel film of the BC under the conditions of our experiment.

Scientific adviser: Doctor of biological sciences Savitskaya I.S.

FUNDAMENTAL ASPECTS OF THE APPLICATION OF ENTOMOPATHOGENIC FUNGUS *BEAUVERIA SP.* AS A PERSPECTIVE AGENT FOR PLANT BIOPROTECTION

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The large-scale use of pesticides has a number of significant shortcomings, the most important of which are the emergence of resistant pest populations and environmental pollution. Due to the deterioration of the environment and the problem of environmental protection, the current and important task of government is the widespread use of biologics of domestic production in the protection of plants instead of chemical pesticides.

Entomopathogenic fungi are an inexhaustible biological resource of natural and selection strains with a selective spectrum of virulence for individual groups of arthropod pests and most of them are harmless to the environment. Therefore, the creation of mycoinsecticides is a direction in biotechnology, which in many countries of the world shows unflagging interest.

It is known that fungi were the first organisms proposed by I.I. Mechnikov and I.M. Krasilshik for factory production in order to use them against harmful insects at the end of the last century. Several species of fungi are recommended for mass production in the world, of which *Beauveria bassiana* (Bals.) Vuill. is ranked at the first place.

At present, there are no biological preparations based on entomopathogenic fungi in Kazakhstan to control the number of harmful arthropods, and locusts in particular. Kazakh Scientific Research Institute of Plant Protection and Quarantine together with the All-Russian Institute of Plant Protection had the projects on screening new strains of the *Beauveria* fungus on the basis of virulence on the Moroccan locust, on sucking pests in greenhouses (in manufacturing conditions), assessing the biological activity of strains in the