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**БИОТЕХНОЛОГИЯ:
СОСТОЯНИЕ
И ПЕРСПЕКТИВЫ
РАЗВИТИЯ**

**BIOTECHNOLOGY:
STATE OF THE ART
AND PERSPECTIVES**

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miRNA INTERACTION WITH mRNA OF *E2F3* GENE

Aisina D.E., Atambayeva Sh.A., Ivashchenko A.T.

al-Farabi Kazakh National University, Almaty, Kazakhstan
 050038, Almaty, al-Farabi avenue, 71,
 e-mail: a.iavashchenko@gmail.com

Characteristics of multiple binding sites for miR-1-2121-3p, miR-19-21199-3p, miR-2-3313-3p, miR-1-155-3p, miR-2-4453-3p, miR-3-8100-5p and miR-20-43381-5p in the protein-coding region of the mRNA *E2F3* gene have been established.

Key words: miRNA, mRNA, *E2F3* gene, breast cancer, diagnostics.

Early diagnosis of breast cancer improves the efficiency of treatment. With nanosized miRNA, which can circulate in the blood, it is possible to reliably control the development of malignant tumors. Changing of miRNA synthesis is one of the main causes of many pathologies, including breast cancer. miRNA can be both as oncogenes and as tumor suppressors also. In the work have been studied the characteristics of the interaction of miRNA with mRNA of gene of the transcription factor *E2F3*, that participating in the development of breast cancer and other oncologic diseases. The MirTarget program [1] defines the following features of binding: the start of the initiation of miRNA binding to mRNAs; the localization of miRNA binding sites in the 5'UTRs, CDSs and 3'UTRs of the mRNAs; the free energy of hybridization ΔG (kJ/mole); the ratio $\Delta G/\Delta G_m$ (%) was determined for each site (ΔG_m equals the free energy of miRNA binding with its perfect complementary nucleotide sequence); the schemes of nucleotide interactions between the miRNAs and the mRNAs. From the 3701 miRNA [2] we identified miRNA which have from one to several binding sites on mRNA of *E2F3* gene (table). These miRNA can be bound in two sites of protein coding region of mRNA. The first site of CDS with 389 nt, that containing multiple miRNA binding sites at intervals of three nucleotides, encodes the oligopeptide AAVVAAAAAAS, and a second site of CDS with 458 nt encodes the oligopeptide AAAAAAAA. Among the eight paralogous human genes *E2F1*- *E2F8*, mRNA of *E2F3* have binding sites with miRNA. Identified multiple binding sites of different miRNA are not random.

Table Characteristics of binding miRNA with mRNA of the transcription factor *E2F3* gene

miRNA	Start of sites, nt	ΔG , kJ/mole	$\Delta G/\Delta G_m$, %	Length, nt
miR-1-155-3p (4)	458 – 470	-125 to -132	91 – 95	25
miR-1-2121-3p (8)	449 – 462	-134 to -140	85 – 89	25
miR-19-21199-3p (8)	452 – 464	-134 to -144	85 – 92	25
miR-2-3313-3p (8)	389 – 462	-136 to -142	85 – 89	25
miR-2-4453-3p (3)	453 – 464	-119 to -121	90 – 92	21
miR-3-8100-5p (3)	391 – 460	-129 to -136	88 – 93	24
miR-20-43381-5p (2)	459 – 468	-119 to -125	90 – 95	21

Note: In parentheses is the number of binding sites.

This is confirmed by the presence of two sites of CDS in mRNA of orthologous genes *Gorilla gorilla*, *Chlorocebus abaeus*, *Macaca mulatta*, *Bos taurus* and other animals. Mir-1-2121-3p, miR-19-21199-3p and miR-2-3313-3p have