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The proceedings are the papers of students, undergraduates, doctoral students and young researchers on topical issues of natural and technical sciences and humanities.

В сборник вошли доклады студентов, магистрантов, докторантов и молодых ученых по актуальным вопросам естественно-технических и гуманитарных наук.

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СЕКЦИЯ 3
ЕСТЕСТВЕННЫЕ НАУКИ

Подсекция 3.1 Биология и биотехнология

UDC 577.2

CIRCULATING NUCLEIC ACIDS AS BIOMARKERS IN LUNG CANCER

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Lung cancer is very difficult to diagnose at the early stages of the cancerogenesis. Therefore surgical treatment and chemotherapy have a little effect. To date the main methods of lung cancer diagnostics are instrumental methods, such as X-ray and endoscopy. At the same time X-ray methods do not allow to establish the stage of the process and even the correct diagnosis for some patients. Another method of lung cancer diagnostics is a cytological screening including the analysis of sputum to detect the atypical cells. However, the detection of lung cancer based on sputum analysis depends on many criteria's, for example the shape of the tumor, the type of tumor growth, the presence of atelectasis. For instance, tumor cells can be detected in sputum in 52-88% of patients with central lung cancer. Atypical cells in the case of peripheral lung cancer are detected only in 33% -61% of patients. Moreover, the interpretation of the cytological picture often can be great difficult [1].

One of the basic methods of diagnosis in oncology is biopsy. Commonly using this method 83,5-95% of diagnoses are confirmed. However, complications such as embolism, implantation metastasis, pneumothorax, bleeding, etc. are possible [2].

Recently, the use of computed tomography has become widespread for the lung cancer diagnostics. This method makes it possible to identify lesions in areas of lung that are inaccessible to X-ray studies. Moreover, computed tomography is characterized by high sensitivity and specificity. However, this is a very expensive method, which limits its use, especially in screening studies of the population [3].

Immunological diagnostics of cancer diseases is very rarely used in clinical medicine. In practice, a number of tumor markers such as CEA (cancer-embryonic antigen), NSE (neuron-specific enolase) and TPA (tissue polypeptide antigen) are used. The disadvantage of this method is the low specificity of these markers for lung cancer, since CEA is primarily used as a biomarker for rectal cancer, and NSE is a marker not only for NSCLC, but also for tumors formed from neural tissue, like neuroblastoma [4].

An increased level of tissue polypeptide antigen (TPA) is observed in bladder carcinoma, in patients with breast cancer, bronchial cancer, intestinal cancer, cervical cancer. The rise in the level of TPA is also evident in some benign tumor of liver [5]. In addition, these markers are often used to monitoring therapy and detect relapses of diseases, but not for early diagnosis of lung cancer.

For the diagnosis of NSCLC, markers of squamous cell carcinoma (SCAA) antigen and cytokeratin 19 (CYFRA 21-1) fragment are used, which, however, are not very effective for lung cancer diagnostics at the early stages [6].

In turn, the use of miRNA as a biomarker for the lung cancer diagnostics has several advantages over existing methods. For instance, changes in the level of miRNAs expression can be detected already at early stages of tumor formation [7].

Materials and methods

In EDTA tube a venous blood sample is taken in an amount of 2 ml. The blood is centrifuged at 3,000 x g for 10 minutes, after which the supernatant (plasma) is collected. Total RNA is isolated

from the plasma. The reverse transcription reaction is carried out. The level of miRNAs (hsa-miR-19b-3p, hsa-miR-125b and miR-155) expression is determined by the qRT-PCR using the SYBRGREEN fluorescent tracerand specific primers. As endogenous control the expression level of a small nuclear RNA - RNU6B is used. A determination of the ΔCT for miRNAs is made based on the expression level.

Results and discussion

miR-19 expression level in the group of "lung cancer without radon" was 6.9 times increased (P<0.0001) as compared to those detected in cancer-free "control" (tab.1).

Table 1 - Relative expression level of miR-19b-3p in lung cancer patients compared to control

	miR19b-3p	U6	ΔCt	ΔΔCt	Relative expression level
Control	28,876±0,381	31,604±0,219	-2,728±0,467	0,00±0,467	1 (0,723-1,382)
LC*	26,482±0,43	31,998±0,21	-5,516±0,516	-3,415±0,516	6,906 (4,827-9,881)

LC*- lung cancer

In the group of patients with lung cancer the level of miR-155 was 2 times higher than in the control group of healthy individuals (p <0.01) (tab.2). In connection with the obtained results, it can be assumed that miR-155-5p is involved in the pathogenesis of lung cancer as oncomir, which does not contradict the data of other studies. In the literature, among well-known oncologists, this microRNA is described as the most significant, because of its involvement in a variety of oncogenic processes.

Table 2 - Relative expression level of miR-155-5p in lung cancer patients compared to control

	miR-155-5p	U6	ΔCt	ΔΔCt	Relative expression level
Control	34,65±0,57	32±0,51	2,65±0,8	0,00±0,8	1(0,57-1,74)
LC	33,51±0,41	32,02±0,47	1,498±0,7	(-1,152)±0,7	2,2 (1,37-3,61)

The comparative analysis did not show a statistically significant difference in the profile of miR-155-5p, depending on the status of smoking. However, there was a tendency to increase miR-155-5p in non-smoking patients.

As shown in Table 3, the relative expression level of miR 125b in lung cancer patients was in 4 times higher than inhealthy people (p <0.001). Thus, it can be concluded that this microRNA is a biomarker of a malignant process in the lung tissue.

Table3 - Relative expression level ofmiR-125b-5p in the groups of "lung cancer + radon" and "lung cancer without radon"

	miR-125b-5p	U6	ΔCt	ΔΔCt	Relative expression level
Control	34,14±0,4	32,1598±0,6	1,98±0,8	0,00±0,8	1(0,581-1,72)
LC	32,05±0,4	32,1796±0,5	(-0,134)±0,7	(-2,11)±0,7	4,31464(2,7-4,8)

When hsa-miR-19b-3p was used as a biomarker the diagnosis was confirmed in 30 of 37

patients, which matches to 81% of cases. In the case of using hsa-miR-125b as a cancer biomarker diagnosis was confirmed in 34 of 37 patients, which matches to 92% of cases. When using hsa-miR-155-5p as an oncomarker, the diagnosis was confirmed in 29 of 37 patients, which matches to 78% of cases.

The obtained results are of interest for the development of the new methods for lung cancer diagnostics.

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TIMELY MEDICAL HELP IN CASE OF BRACHIAL PLEXUS INJURIES, COMPLICATIONS AND REHABILITATION

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The brachial plexus is a network of intertwined nerves that control movement and sensation in the arm and hand. A traumatic brachial plexus injury involves sudden damage to these nerves, and may cause weakness, loss of feeling, or loss of movement in the shoulder, arm, or hand.

The brachial plexus begins at the neck and crosses the upper chest to the armpit. Injury to this network of nerves often occurs when the arm is forcibly pulled or stretched.

Mild brachial plexus injuries may heal without treatment. More severe injuries may require surgery to regain function of the arm or hand.

Traumatic brachial plexus injuries, which are most commonly sustained in high speed motor vehicle accidents or while engaged in sporting events, affect the sensibility and muscle power in part of or the entire limb. Approximately 15% of brachial plexus injuries have an injury to the blood supply of the arm as well, and emergency surgery may be indicated.