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FROM CELLULAR MUTATION TO THE STRUGGLE FOR LIFE

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Abstract: This article presents, in a scientific yet accessible manner, how cancer originates at the cellular level, the mechanisms of its development, and the body's struggle against it. Based on statistical data and the author's analysis, it demonstrates the importance of a healthy lifestyle and highlights the possibilities for preventing the disease.

Keywords: cell mutation, cancer, oncogenesis, DNA, proto-oncogene, tumor suppressor genes, metastasis, immune system, prevention, healthy lifestyle

The human body is a complex and remarkably perfect system made up of trillions of cells. Each cell performs its function precisely: it grows, divides, and is eliminated when necessary. Yet within this perfect system, a very small, almost imperceptible error sometimes occurs. This very error, a malfunction at the cellular level, can in some cases become a serious threat to human life. A simple question arises: how can one small cellular error trigger a struggle for survival of the entire organism?

Cancer is a genetic disease that arises from mutations accumulated in the DNA of a cell. The conversion of proto-oncogenes into oncogenes, or the inactivation of tumor suppressor genes, leads to uncontrolled cell division.

The life of a cell is under strict control. In a process known as the cell cycle, the cell grows, replicates its DNA, and divides. This process is regulated by special control points called checkpoints. If an error is detected in the DNA, the cell attempts to repair itself or activates apoptosis, that is, the mechanism of programmed self-destruction. This is an important system that protects the organism.

According to scientific sources, the development of cancer is a multistage process that proceeds in the following sequence:

1. Initiation: the emergence of a genetic alteration
2. Promotion: the proliferation of the altered cells
3. Progression: the acquisition of invasive and metastatic properties

During this process, cells evade apoptosis, stimulate angiogenesis, and hide from the immune system.

Today, cancer is one of the leading causes of death worldwide.

Global cancer statistics

Indicator	**Value**	**Source**
New cases (per year)	~19.3 million	WHO, GLOBOCAN
Deaths (per year)	~10 million	WHO
Most common type	Breast cancer	GLOBOCAN

Indicator	Value	Source
Leading cause of cancer death	Lung cancer	WHO
Proportion that is preventable	30–50%	WHO

Cancer develops gradually. At first, a single cell escapes control and then multiplies rapidly to form a tumor. If it is not detected in time, these cells spread to other organs through the blood and lymph; this process is called metastasis. Metastasis is considered the most dangerous stage of cancer. Nevertheless, the body fights against this process. The immune system detects foreign or altered cells and tries to destroy them. However, some cancer cells manage to "hide" from this surveillance and escape it. As a result, the disease continues to progress.

Modern medicine is humanity's greatest weapon in this struggle. Today, various methods of treating cancer are available: chemotherapy, radiotherapy, immunotherapy, and targeted therapy. Immunotherapy in particular has achieved major breakthroughs in recent years, making it possible to direct the body's own defense system against cancer. Statistical observations show that the risk of developing cancer is considerably lower in people who follow a healthy lifestyle. For example, in people who engage in regular physical activity, the risk of cancer is reduced by 20–30%. Proper nutrition, quitting smoking, and limiting alcohol consumption can reduce the likelihood of developing certain types of cancer by nearly half. In cases detected through early diagnosis, treatment effectiveness can reach 80–90%.

In this article, the influence of lifestyle on the development of cancer was examined on the basis of open international data (WHO, CDC, GLOBOCAN).

Lifestyle and cancer risk

Lifestyle factor	Description	Association with cancer	Scientific mechanism	Risk level	Preventive recommendation	Source
1. Smoking	Tobacco and nicotine use	Lung, oral, and throat cancer	Carcinogens damage DNA	Very high	Quit smoking completely	WHO, CDC
2. Alcohol	Alcoholic beverages	Liver and breast cancer	Acetaldehyde causes DNA mutations	High	Complete restriction	WHO
3. Unhealthy diet	Fast food, fatty foods	Digestive system cancer	Obesity and inflammation	High	Balanced diet	WHO
4. Obesity	Excess body weight	Breast, colorectal, and kidney cancer	Hormonal disruption and inflammation	High	Weight control	IARC
5. Physical inactivity	Sedentary lifestyle	Colorectal and breast cancer	Slowed metabolism	Medium–high	Daily exercise	WHO

Lifestyle factor	Description	Association with cancer	Scientific mechanism	Risk level	Preventive recommendation	Source
6. Chronic stress	Constant psychological pressure	Indirect effect	Weakened immune system	Medium	Stress management	CDC
7. Sleep deprivation	Less than 5–6 hours of sleep	Breast and endocrine cancers	Hormonal balance is disrupted	Medium	7–8 hours of sleep	NIH
8. Sunlight (UV)	Prolonged sun exposure	Skin cancer	DNA is damaged by ultraviolet radiation	High	SPF cream, protection	WHO
9. Infections	HPV and HBV viruses	Liver and cervical cancer	Viral DNA integrates into the host genome	Very high	Vaccination	IARC
10. Water and food quality	Contaminated products	Digestive system cancer	Toxins accumulate	Medium	Clean, safe food	WHO
11. Heredity	Familial genetic factor	Various types of cancer	Gene mutations are inherited	Medium–high	Screening	Nature, WHO
12. Lack of early diagnosis	Not undergoing check-ups	All types	Disease is detected late	Very high	Regular check-ups	WHO

The data in the table clearly show that lifestyle factors have a significant influence on the development of cancer. The analysis indicates that smoking, viral infections (HPV, HBV), ultraviolet (UV) radiation, and an unhealthy diet stand out as the highest-risk factors. These factors can initiate oncogenic processes either through direct DNA damage or through disruption of the cell's genetic structure.

Medium-risk factors include physical inactivity, obesity, chronic stress, and sleep deprivation. Although these factors do not cause cancer directly, they weaken the body's immune system, disrupt hormonal balance, and slow metabolic processes. As a result, the body loses its ability to fight cancer cells.

The analysis also shows that a large proportion of the factors affecting cancer risk are modifiable, that is, they can be changed through a person's way of life. In particular, preventive measures such as quitting smoking, healthy eating, regular physical activity, and vaccination against infections considerably reduce the risk of developing cancer.

According to the World Health Organization (WHO) and the International Agency for Research on Cancer (IARC), approximately 30–50 percent of cancers can be prevented. This

confirms that the occurrence of cancer depends not only on genetic factors but also directly on a person's daily lifestyle.

In conclusion, one small cellular error can lead to major consequences. However, in this struggle a person is not alone. The progress of science, modern medicine, and, most importantly, a person's responsibility for his or her own life all play an important role in the fight against this disease. By adopting a healthy lifestyle, undergoing regular medical check-ups, and giving up harmful habits, each person can protect his or her own life.

Within every cell lies a delicate balance between life and danger. Preserving it is in our own hands!

List of references

1. Carlberg C., Velleuer E. Cancer Biology: How Science Works. Springer, 2021.
2. Pezzella F. et al. Oxford Textbook of Cancer Biology. Oxford University Press, 2019.
3. Sobti R.C. et al. Handbook of Oncobiology. Springer, 2024.
4. Abeloff M.D. et al. Abeloff's Clinical Oncology. Elsevier, 2019.
5. IARC. GLOBOCAN Database, 2022.
6. CDC. Cancer Statistics, 2023.