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НОВЫЙ ДЕНЬ В МЕДИЦИНЕ  
NEW DAY IN MEDICINE**

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## CAUSES AND MOLECULAR TYPES OF BREAST CANCER

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✓ **Resume**

*This article describes the causes of breast cancer and their prevention measures. Specific molecular types of breast cancer are revealed.*

**Keywords:** Breast cancer, molecular types, prevention

## ПРИЧИНЫ И МОЛЕКУЛЯРНЫЕ ТИПЫ РАКА МОЛОЧНОЙ ЖЕЛЕЗЫ

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✓ **Резюме**

*В данной статье описываются причины возникновения рака молочной железы и меры их профилактики. Выявлены конкретные молекулярные типы рака молочной железы.*

**Ключевые слова:** Рак молочной железы, молекулярные типы, профилактика.

## KO'CHIRISH SARATINI SABABLARI VA MOLEKULAR TURLARI

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✓ **Rezyume**

*Ushbu maqolada ko'krak bezi saratonining sabablari va ularning oldini olish choralari tasvirlangan. Ko'krak saratonining o'ziga xos molekulyar turlari aniqlanadi.*

**Kalit so'zlar:** Ko'krak saratoni, molekulyar turlari, oldini olish

### Relevance

**B**reast cancer is a malignant tumor that occurs in the tissues of the mammary glands. It is the most common type of cancer among women in the world, with an incidence of 99.4 cases per 100,000 women between the ages of 13 and 90. According to the WHO, 800,000-1,000,000 new cases of the disease are recorded every year in the world. Most of the tumors that appear in the mammary glands are of good quality and are not considered dangerous: they grow slowly, the tumor cells are not significantly different from healthy cells, and they do not spread to other organs or parts of the body. Cancer occurs as a result of mutations - atypical changes in genes responsible for regulating growth in cells and keeping them healthy. Bad-quality cells multiply uncontrollably, so over time they can spread beyond the primary tumor to surrounding healthy tissues, lymph nodes, and distant organs. A malignant tumor developed from mammary gland cells is called breast cancer. Most often, the disease begins in the lobular cells (glands that produce milk) or in the ducts (the paths through which the milk produced in the lobules reaches the nipple). In most cases, breast cancer occurs accidentally. In only 10% of cases, the disease is inherited due to mutations in the BRCA1 and BRCA2 genes. The presence of the mutation is estimated to increase the risk of developing breast cancer by 60-80%, so in

some European countries it is an indication for preventive mastectomy (complete removal of the breast).

Cancer risk factors. These are the reasons that trigger the onset of cancer. But it should be remembered that this is only about the probability of cancer, not about the inevitable development of the disease in a certain patient.

Risk factors are divided into two groups - factors that cannot be influenced and factors that can be reduced:

Uncontrollable risk factors include:

- Female gender. The disease rarely develops in men (it may be due to a mutation in genes);
- Age. In 90 percent of cases, the disease is diagnosed in patients over 40 years old;
- Genetic predisposition, presence of mutations in BRCA1 and BRCA2 genes;
- Dangerous precancerous (precancerous) diseases of mammary glands;
- Presence of breast cancer in the anamnesis;
- History of chest radiation exposure;
- Early onset of menstruation or menarche (before the age of 12), late menopause (after the age of 55).

Risk factors that can be influenced:

- A woman's inability to become pregnant (the risk increases if she is not pregnant), refusal to breastfeed, artificial termination of pregnancy;
- Obesity;
- Diabetes, hypertension;
- Long-term use of steroid hormones, hormonal contraceptives;
- Abuse of alcoholic beverages, smoking;
- Insufficient physical activity;
- Night work schedule.

Molecular types of breast cancer

The prognosis of the course of the disease and how it responds to treatment depends on the molecular-genetic characteristics of the tumor.

The presence or absence of estrogen (ER) and progesterone (PR) hormone receptors, HER2 / neu epidermal growth factor receptors and other molecular and genetic markers in tumor cells is taken into account.

Accordingly, the following subtypes are distinguished:

- Luminal A (30-45%). These are tumors with hormone receptors (estrogen and/or progesterone), no HER2 receptor, and low Ki67 levels. The tumor is highly differentiated (G1), usually grows slowly, the disease has the best prognosis;
- Luminal B (14-18%). Hormone receptors (estrogen and/or progesterone) are present, HER2-positive or HER2-negative, Ki67 is high. The tumor grows faster than type A cancer, and the prognosis is slightly worse;
- "Triple negative" (8-15%). It does not have receptors for hormones (estrogen and progesterone) and HER2. This type of cancer has a BRCA1 gene mutation and is more common among young women;
- HER2 positive (27-39%). Tumors do not have hormone receptors (estrogen and progesterone), but receptors for HER2 are present. The tumor grows faster than luminal subtypes, may have a worse prognosis, but is better treated with targeted therapy targeting the HER2 protein.

Pathological gradation

The degree of differentiation of tumor cells "G" refers to the difference between breast cancer cells and normal cells and the rate of increase in the number of tumor cells.

- G1 is a highly differentiated tumor. Cancer cells are similar to healthy cells, their growth rate is slow and the probability of metastasis is low;
- G2 - moderately differentiated tumor. Tumor cells have the characteristics of normal cells, have average indicators of the rate of reproduction and the probability of the formation of metastases;
- G3 is a poorly differentiated tumor. Cancer cells have almost no signs of normal cells, the rate of reproduction and the probability of metastasis are high. Such diseases are the most aggressive and dangerous.

**Purpose of the study:** To study the causes and molecular types of breast cancer

## Materials and Methods

To provide clinical and morphological justification for modern complex treatment methods for breast cancer. Study Types and Objects: 150 patients with breast cancer treated between 2018 and 2023 were clinically and morphologically studied. Patients were divided into groups according to their molecular type and stage of disease.

HER2-enriched breast cancer HER2-enriched breast cancers are commonly called HER2-positive. They may be hormone receptor-positive or hormone receptor-negative. HER2-enriched breast cancers make up 10% to 15% of breast cancer cases. Compared to luminal A and luminal B cancers, HER2-enriched cancers tend to be: faster growing more aggressive higher grade diagnosed at a later stage Without treatment, HER2-enriched cancers have a worse prognosis than luminal cancers; however, there are multiple medicines that target HER2-positive cancers, including Herceptin (chemical name: trastuzumab) and Perjeta (chemical name: pertuzumab). Common treatments for HER2-enriched breast cancer are: surgery radiation therapy chemotherapy targeted therapy The complex profile of each subtype is determined using molecular and genetic information from tumor cells.

Most studies divide breast cancer into 4 main molecular subtypes:

- Luminal A
- Luminal B
- Basal-like/triple negative
- HER2-enriched

These subtypes also appear in ductal carcinoma in situ (DCIS)

There are many other less common molecular subtypes, including claudin-low and molecular apocrine types.

### Luminal A

Luminal tumor cells look the most like cells of breast cancers that start in the inner (luminal) cells lining the mammary ducts.

Luminal A tumors tend to be:

- Estrogen receptor-positive (ER-positive)
- HER2 receptor-negative (HER2-negative)
- Tumor grade 1 or 2

About 40 percent of breast cancers are luminal A tumors

Of the 4 main molecular subtypes, luminal A tumors tend to have the best prognosis (chance of survival), with fairly high survival rates and fairly low breast cancer recurrence rates

### Luminal B

Luminal tumor cells look like the cells of breast cancers that start in the inner (luminal) lining the mammary ducts.

Luminal B tumors tend to be ER-positive. They may be HER2-negative or HER2-positive.

Women with luminal B tumors are often diagnosed at a younger age than those with luminal A tumors.

Compared to luminal A tumors, luminal B tumors tend to have factors that lead to a poorer prognosis including :

- Poorer tumor grade
- Larger tumor size
- Lymph node-positive

Triple-negative or basal-like breast cancer is estrogen receptor-negative, progesterone receptor-negative, and HER2-negative. Triple-negative breast cancer is more common in: people with a BRCA1 mutation younger women Black women Worldwide, about 20% of all breast cancers are triple-negative. 5 According to the American Cancer Society, in the United States, triple-negative breast cancer represents 10% of

breast cancers overall, but nearly 20% among Black women Compared to luminal A, luminal B, and HER2-enriched breast cancer, triple-negative breast cancer is: faster growing higher grade more aggressive Because triple-negative breast cancer lacks receptors for estrogen, progesterone, and HER2, hormonal therapy medicines and anti-HER2 medicines aren't effective treatments.

### Conclusion

Up to 15% of people with breast cancer develop the disease because they have inherited genetic mutations. The most common genetic mutations involve the BRCA1 and BRCA2 genes. Smoking: Tobacco use has been linked to many different types of cancer, including breast cancer. Objective

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