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ВЛИЯНИЕ ПИЩЕВЫХ ПРОДУКТОВ НА РАЗВИТИЕ И ПРОФИЛАКТИКУ РАКА

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THE FOOD INFLUENCE ON THE DEVELOPMENT AND CANCER PREVENTION

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Резюме. Рак - нарушение обмена веществ, в основе которого лежит нарушение выработки клеточной энергии. На сегодняшний день известно множество причин появления и развития рака, таких как дисфункция митохондрий, влияние питания, регуляция гормонов щитовидной железы.

Ключевые слова: рак, нарушение обмена веществ, митохондрия, питание, гормоны

Resume. Cancer is a metabolic disorder fundamentally linked to the impaired cellular energyprod uction. Currently numerous factors contributing to the cancer initiation and progression arerecognized, including mitochondrial dysfunction, the influence of nutrition, regulation of thyroidhormones.

Keywords: cancer, metabolic disorder, mitochondria, nutrition, hormones.

Relevance. Cancer remains one of the death leading causes worldwide, so it is important to explore alternative therapeutic strategies that target fundamental metabolic vulnerabilities, such as mitochondrial dysfunction, nutritional influences, thyroid hormone regulation, and the antioxidants role, highlighting key metabolic vulnerabilities and practical strategies for prevention and treatment.

Objectives: to understand the food influence on cancer.

Materials and methods. Literature analysis and material generalization were used.

Results and their discussion. Nowadays, cancer is increasingly recognized not simply as a genetic disease, but as a metabolic disorder fundamentally linked to impaired cellular energy production. Research elucidates that disruptions in mitochondrial function, and the consequent reliance on anaerobic glycolysis (the Warburg effect), play a pivotal role in both the neoplastic disease genesis and progression. Given the World Health Organization's designation of cancer as the global mortality leading cause, it becomes imperative to investigate alternative therapeutic strategies targeting these fundamental metabolic vulnerabilities. [1]

In our body, mitochondria play a vital role in the cellular energy metabolism and apoptosis regulation. Nicotinamide (a form of vitamin B3), along with essential macro- and microelements, influences cellular energy optimization primarily by serving as a precursor to NAD+ (nicotinamide adenine dinucleotide), a critical coenzyme in cellular metabolism, which means directly supporting mitochondrial function. NAD+ plays a central role in redox reactions that generate ATP during oxidative phosphorylation in mitochondria. So it may help correct the metabolic shifts seen in cancer cells. [2]

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Research suggests a possible link between eating polyunsaturated fats (PUFAs), especially those in fish oil and vegetable oils, and a higher chance of getting cancer. Omega-3 and omega-6 fats can easily go bad through oxidation, which creates harmful free radicals in the body. These free radicals can harm cells and DNA, possibly helping cancer to start and grow. It's also been suggested that eating these fats that oxidize easily might weaken the immune system, making it harder for the body to fight off cancer cells. [3]

Carrageenan and other food additives can cause the intestines inflammation, increasing permeability and promoting the absorption of toxins and endotoxins. Chronic exposure to toxins can weaken the immune system, leading to immunodeficiency and ultimately increasing the tumor formation risk. By disrupting the gut natural barrier function, these additives may contribute to the systemic inflammatory state that promotes the development of cancer.

Caffeine, when consumed in moderation, rich in magnesium and antioxidants, improves metabolism and provides protective action against cancer caused by radiation, chemical carcinogens, viruses, and estrogens. Caffeine synergizes with progesterone, increasing its level, and protects against breast cancer. It also inhibits apoptosis, protecting cells during stress, and is used in conjunction with some cancer treatment methods to enhance their effectiveness and reduce side effects. Therefore, coffee really helps with stress and is a beneficial drink in moderate doses.

Vitamins A, D, E, K, C, and B-complex vitamins play a supportive role in strengthening immunity and protecting cells from damage, however, some antioxidants during radiation therapy may reduce the cancer treatment effectiveness. It's important to mention that taking vitamins for oncology should be coordinated with a doctor, as some of them may stimulate tumor growth, especially if the dosage is not properly adjusted.

The thyroid gland main hormones – thyroxine (T4) and triiodothyronine (T3) – the cancer cells growth and aggressiveness affect through several mechanisms, including the activation of the integrin receptor αvβ3 on the surface of tumor and endothelial cells. At non physiological concentrations, T4 stimulates the division of tumor cells, promotes their survival (anti-apoptosis), supports resistance to radiotherapy, and enhances angiogenesis (the formation of new blood vessels), which contributes to tumor growth. Normalization of thyroid function is not just about maintaining hormonal balance; it is also an important factor influencing the cancer cells growth and aggressiveness. High levels of T4 promote tumor growth and resistance to therapy, while hypothyroidism and dominance of T3 may slow the cancer progression. Therefore, monitoring and adjusting thyroid function in patients with oncology is clinically significant for improving prognosis and disease management.

Antioxidants play a significant role during cancer therapy. They provide cellular protection by shielding healthy cells from damage, which can be crucial during treatment. However, it's important to consider that antioxidants may interfere with therapy; they can potentially neutralize therapy-induced oxidative damage, which is sometimes necessary for the treatment's effectiveness. Therefore, careful antioxidants timing and dosing are essential to maximize their benefits while minimizing any adverse effects on the therapeutic process.

In conclusion of all the above, the main recommendations regarding proper nutrition. Reducing the consumption of fast-prepared and canned foods will decrease the number of inflammatory processes in cells and, consequently, reduce the tumor

development likelihood. Additionally, consuming foods rich in nutrients and substances that support thyroid function positively affects overall health. And last but not least is exercising. Studies show that even climbing three flights of stairs can lower cancer risk by 20%.

Conclusion:

1. Cancer is a pathology associated with disrupted mitochondrial energy exchange and a metabolic shift towards anaerobic glycolysis.

2. Supporting mitochondrial function is a promising direction for the cancer prevention and treatment. The nicotinamide (vitamin B3) impact on optimizing cellular energy, mechanisms for increasing carbon dioxide levels to suppress glycolysis and sustain oxidative phosphorylation, as well as correcting mineral metabolism, are being investigated.

3. Polyunsaturated fatty acids, especially from fish oil and vegetable oils, increase the likelihood of developing cancer. Omega-3 and omega-6 are easily oxidized, leading to the free radicals formation and decrease immunity.

4. Carrageenan and other food additives can cause the intestines inflammation, increasing permeability and promoting the toxins and endotoxins absorption, leading to immunodeficiency and tumor formation increased risk.

5. Normalizing thyroid function is important for regulating cellular metabolism and protecting against cancer, as thyroid hormones stimulate cellular respiration and energy exchange, which hinders the tumor cells growth. Additionally, the thyroid gland helps reduce estrogen levels and maintain overall metabolic balance in the body.

6. Caffeine, consumed in moderation, rich in magnesium and antioxidants, improves metabolism and provides protective action against cancer caused by radiation, chemical carcinogens, viruses and estrogens. Caffeine synergizes with progesterone, increasing its level and protects against breast cancer. It also inhibits apoptosis, protecting cells during stress and used in conjunction with some cancer treatment methods to enhance their effectiveness and reduce side effects.

7. Vitamins A, D, E, K, C and B-complex vitamins play a supportive role in strengthening immunity and protecting cells from damage, however, some antioxidants during radiation therapy may reduce the cancer treatment effectiveness.

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