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Природные Иммуномодуляторы, Регулирующие Иммунитет В Лейкозах При Опухоли

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Аннотация: Иммунная система играет ключевую роль в противоопухолевой защите организма, однако при лейкозах её функциональная активность существенно нарушается. В последние годы особое внимание уделяется природным иммуномодуляторам, способным корректировать иммунный ответ и повышать эффективность противоопухолевой терапии. К таким веществам относятся фитохимические соединения растений (флавоноиды, сапонины, алкалоиды), продукты пчеловодства, морские биологически активные вещества, а также пробиотики. Их использование способствует нормализации клеточного и гуморального звена иммунитета, стимуляции противоопухолевой активности Т-лимфоцитов и натуральных киллеров, а также снижению иммунодепрессии, вызванной химиотерапией. Рассмотрение природных иммуномодуляторов как вспомогательных средств в комплексной терапии лейкозов открывает новые перспективы в повышении эффективности лечения и улучшении качества жизни пациентов.

Ключевые слова: лейкоз, опухоли, иммунитет, иммуномодуляторы, природные соединения, фитохимические вещества, противоопухолевая терапия, Т-лимфоциты, натуральные киллеры, пробиотики.

Introduction: The human immune system is a vital defense mechanism, providing the body with resistance to infection and tumors. Malignant neoplasms of the hematopoietic and lymphoid tissues, particularly leukemia, are associated with significant suppression of immune activity, which reduces the effectiveness of natural tumor-fighting mechanisms. One promising area of modern oncohematology is the use of natural immunomodulators capable of regulating the immune response and enhancing the immune system's antitumor activity.

The aim of this work is to examine the mechanisms of immune dysfunction in leukemia and to analyze the role of natural immunomodulators in the complex therapy of tumors of the hematopoietic system.

The main goal of chemotherapy is to stop the aggressive growth and division of cancer cells. However, unlike conventional drugs, which act on narrowly targeted targets, chemotherapy affects both tumor cells and some healthy, rapidly dividing cells in the body.

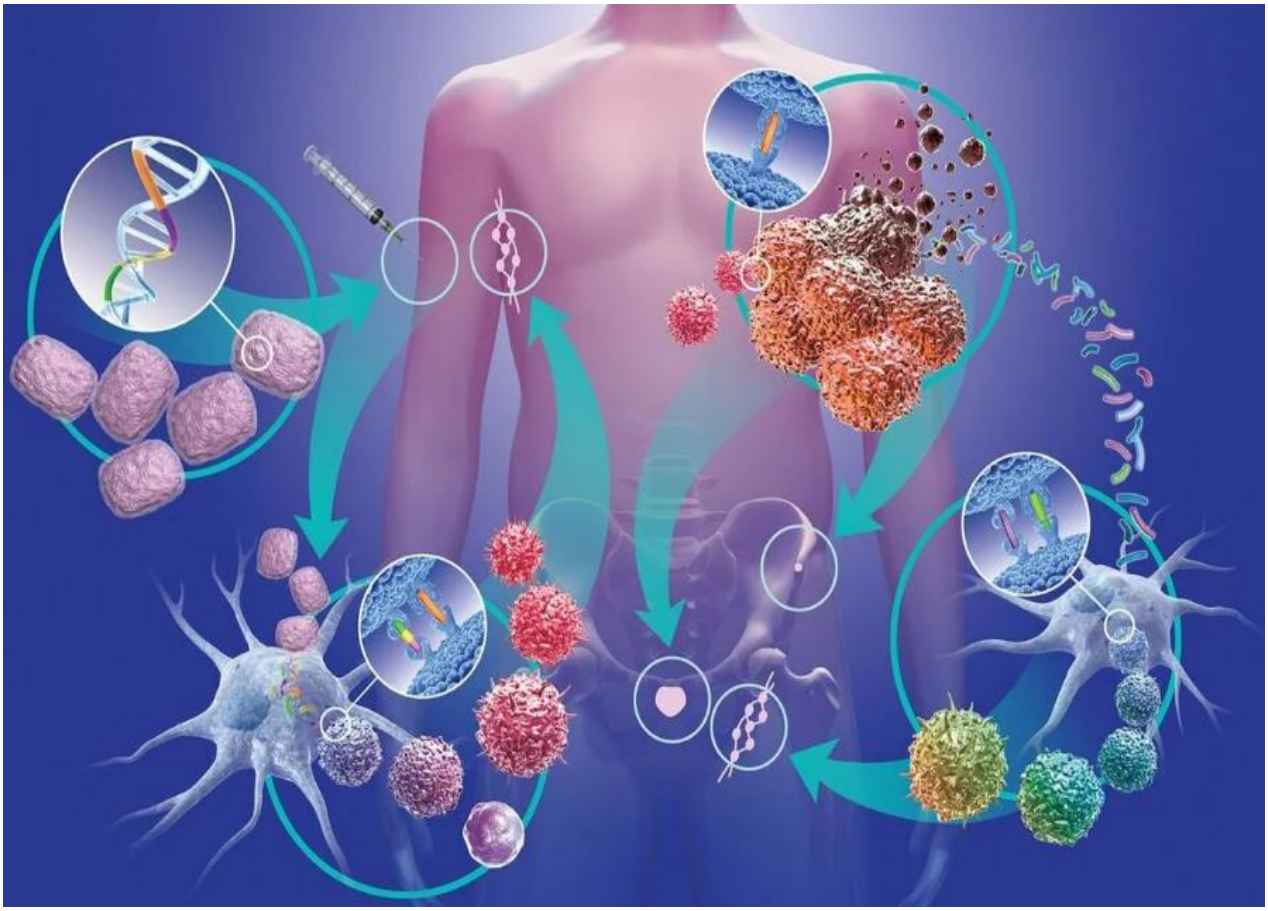
Therefore, chemotherapy damages hair follicles, hematopoietic cells, the liver, and the gastrointestinal tract. The same happens to active immune cells and the mucous membranes of the upper respiratory tract—they also become targets along with cancer cells.

People with cancer already have compromised immunity. Not only do immune system cells interact poorly with each other in oncology, but the number of immune cells themselves decreases with age due to the degradation of the lymphoid tissue in which they are formed.

Test results: Features of immunity in leukemia and tumors Leukemias are malignant diseases of the hematopoietic system, characterized by abnormal proliferation and accumulation of blast cells. This results in anemia, thrombocytopenia, and immunodeficiency . The main immune system disorders in leukemia include:

- ✓ suppression of the function of T-lymphocytes and natural killer cells (NK cells);
- ✓ decreased production of interleukins and γ-interferon;
- ✓ violation of B-lymphocyte differentiation and antibody synthesis;
- ✓ increased susceptibility to infections and reduced antitumor activity.

These changes create the need for the use of agents capable of restoring immune balance.



Picture. Immune regulation and the role of immunomodulators in antitumor immunity.

Natural Immunomodulators: Classification and Mechanisms of Action. Natural immunomodulators are naturally occurring substances that regulate the activity of cellular and humoral immunity. Their action is aimed at stimulating or normalizing the immune response. Main groups:

- ✓ **Phytochemical compounds of plants** (flavonoids, alkaloids, saponins, terpenoids).
- ✓ **Beekeeping products** (propolis, royal jelly, beeswax).
- ✓ **Marine biologically active substances** (chitosan, laminarin, carrageenans).
- ✓ **Microbial immunomodulators and probiotics** .

Mechanisms of action: activation of phagocytes and NK cells , stimulation of the production of interleukins (IL-2, IL-12) and interferons , increased antioxidant protection , inhibition of tumor cell proliferation.

Plant-based immunomodulators. Numerous plants contain biologically active substances with immunomodulatory properties:

Plant-based immunomodulators

- **Ginseng (Panax ginseng)** – saponins (ginsenosides) stimulate the activity of macrophages and NK cells, increase the body's resistance to stress and cytostatic therapy.
- **Eleutherococcus (Eleutherococcus senticosus)** – has adaptogenic and immunomodulatory properties, improves the function of T-lymphocytes.
- **Purple coneflower (Echinacea purpurea)** – stimulates the synthesis of interleukins , increases the activity of phagocytes and natural killers.
- **Aloe vera (Aloe vera)** – contains polysaccharides (acemannan), which increase lymphocyte proliferation and interferon production.
- **Turmeric (Curcuma longa)** – curcumin has a pronounced anti-inflammatory and antioxidant effect, inhibits the growth of tumor cells.
- **Green tea (Camellia sinensis)** – catechins (EGCG) reduce the proliferation of tumor cells and stimulate apoptosis.
- **Astragalus (Astragalus membranaceus)** – enhances interferon production, supports T-cell immunity.
- **Uncaria Tomentosa (cat's claw) -** alkaloids stimulate the production of cytokines and have an immunocorrective effect.
- **Flavonoids** (quercetin , rutin, green tea catechins) - enhance the production of cytokines, have an antioxidant effect, and slow the growth of tumor cells.
- **Saponins** (ginseng, eleutherococcus, licorice) activate macrophages and NK cells, helping to restore the immune response.
- **Alkaloids** (echinacea, uncaria tomentosa , isopine) - stimulate cellular immunity and antibody synthesis.
- **Mushroom polysaccharides** (beta- glucans from shiitake , reishi , agaric) enhance phagocytic activity and antitumor immunity.

Bee products, marine compounds and probiotics

- **Propolis** contains phenolic compounds and flavonoids that stimulate the synthesis of interferon and the activity of macrophages.
- **Royal jelly** increases the body's resistance to stress and infections and improves tissue regeneration.
- **Marine biopolymers** (chitosan , laminarin) activate complement and stimulate the production of interleukins .
- **Probiotics** (lactobacilli , bifidobacteria) normalize the intestinal microbiocenosis , reduce the level of inflammatory cytokines and strengthen the barrier function of the immune system.
- **Chitosan (from crustacean shells)** – stimulates the production of IL-2, activates macrophages.
- **Laminarin (from brown algae)** is a beta- glucan that enhances the non-specific immune response.
- **Carrageenans (from red algae)** – have antiviral and immunostimulating activity.
- **Fucoidan (brown algae)** – induces apoptosis of tumor cells, enhances the immune response.

Prospects for the use of natural immunomodulators in the treatment of leukemia

The inclusion of natural immunomodulators in the complex therapy of leukemia is considered as an additional tool aimed at:

- ✓ reduction of immunosuppression caused by chemotherapy;
- ✓ reducing the risk of infectious complications;
- ✓ strengthening the body's antitumor response;
- ✓ improving the general condition and quality of life of patients.

Current research confirms that combining standard therapy with natural immunomodulators can enhance its effectiveness and reduce side effects. However, clinical trials are needed to standardize dosages and evaluate long-term effects.

Physical activity and nutritional support are essential for maintaining the body and immune system. Adequate and nutritious nutrition is a mandatory component of treatment. Furthermore, it ensures good tolerability of chemotherapy. If a patient does not eat, they experience problems with muscle mass, which impairs chemotherapy tolerance and rehabilitation. The speed of recovery after chemotherapy depends on how well the patient's nutritional needs are met.

Physical therapy, with a combination of different types of exercise, strengthens the cardiovascular system, increases muscle mass, has a positive effect on metabolism, and supports the restoration of immunity. Support during and after chemotherapy should be comprehensive. It's important to remember the risks during cold and flu season and take modern preventative measures, maintaining a healthy diet, and maintaining a daily routine.

Conclusion

Natural immunomodulators represent a promising approach to leukemia therapy, as they can restore the immune balance and enhance the body's antitumor activity.

The use of herbal remedies , bee products, mushroom and marine polysaccharides helps normalize cellular and humoral immunity, reduce the toxicity of standard chemotherapy and improve the quality of life of patients.

The immunomodulatory effect of natural substances is associated with the activation of macrophages, T-lymphocytes and natural killers, stimulation of the synthesis of interleukins and interferons, as well as antioxidant protection of cells.

The inclusion of natural immunomodulators in the complex treatment of leukemia can reduce the incidence of infectious complications and increase the effectiveness of antitumor therapy.

Natural immunomodulators have a multifunctional effect: they simultaneously regulate the immune response, inhibit tumor cell growth, and have a general strengthening effect on the body.

Despite the positive results of experimental and clinical studies, further standardization of dosages, safety studies, and the development of uniform protocols for the use of natural immunomodulators in oncohematological diseases are necessary.

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