

Data from the World Health Organization shows a steady increase in morbidity and mortality from prostate cancer, which makes this problem significant. With the implementation of modern medical accelerators in the treatment of prostate cancer, radiotherapy became the dominant technique for these treatments. Its main principle is to bring a high radiation dose strictly to the tumor, minimizing the dose to surrounding normal tissues and organs. Despite the existence of modern methods of irradiation in external beam radiation therapy, the possibility of their universal use in all oncology institutions is limited by the need for expensive equipment and its constant updating, which involve considerable financial costs. This fact makes it impossible to use modern methods of radiotherapy in clinics, where insufficient attention is paid to financing. The aim of the study is to search for an alternative to the VMAT method, in perspective of the lack of this technique in many oncological dispensaries of post-Soviet countries due to inadequate funding, lack of technical equipment and expensive licenses.

For the prostate cancer treatments, VMAT and IMRT (equidistantly spaced 9 irradiation fields) are used in most clinical cases. The main advantage of the VMAT method is a short time of irradiation of the patient (3-5 min.), which increases the potential number of patients treated in comparison with other methods of irradiation. When patients are irradiated using IMRT, the most effective coverage of the target with the prescribed dose is achieved, while the irradiation of adjacent tissues and organs is minimal.

In connection with the described difficulties, it is proposed to obtain a volume-modulated dose distribution by improving the established planning algorithm by the IMRT method. Creating a volume modulated dose distribution by the IMRT method allows not using more modern expensive equipment (specialized medical linear accelerators) to introduce the VMAT method, but at the same time, results in decreasing of the patient irradiation time compared to the standard approach to IMRT.

The patient irradiation course according to the developed method IMRTnew consists of several irradiation plans, which are calculated with a shift in the angle of rotation of the accelerator gantry by a certain number of degrees. Each calculated plan is assigned to a certain day of treatment from the total number of days of the entire course of exposure.

The use of 7 irradiation fields in each individual plan reduced the patient exposure time by more than 20% compared to the standard IMRT plan. The results obtained from the developed IMRTnew method are equivalent or better than using the VMAT method.

ANTIOXIDANT PROPERTIES OF JUICES CONTAINING CHERRY, RASPBERRY AND STRAWBERRY

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The comparative study of the antioxidant activity of the packaged juices of cherry, raspberries and strawberry. The dependence of the fluorescence intensity of fluorescein from the logarithm of the concentration of juice, of which graphically determined indicators IC_{50} .

Keywords: antioxidant activity, juices of cherry, raspberries, strawberry, fluorescein.

Excess concentration of free radicals in the body is the central risk factor for cardiovascular, oncological diseases and other pathologies. Flavonoids have strong antioxidant properties and can be used to prevent various diseases. Many berries include flavonoids such as quercetin and rutin, as well as anthocyanins and other phenolic glycosides that act as free radical inhibitors [1-3].

A comparative study of the antioxidant activity of 4 packaged juices of various brands containing cherries: «Rich» (Russia) (1), «Sochny» (Belarus) (2), «Fruto-nanya» (Russia) (3), «My family» (Belarus) (4) (table 1); 5 packaged juices containing raspberries: «My family» (Belarus) (1), «Dobry» (Belarus) (2), «Fruto-nanya» (Russia) (3) and (4), «Soki Pridonya» (5) (Table 2) and 4 packaged juices containing strawberries: «Odesski» (Ukraine) (1), «My Family» (Belarus) (2), «Fruto-nanya» (Russia) (3) and (4) (Table 3). Also, a comparison of these juices with juices from fresh berries is made. The method of determining the antioxidant activity with respect to activated forms of oxygen is based on measuring the fluorescence intensity of the oxidizable compound and its decrease under the influence of active oxygen species. In this work, fluorescein is used to detect free radicals, which has a high extinction coefficient and close to 1 quantum yield of fluorescence. Generation of free radicals was carried out using the Fenton system, in which hydroxyl radicals are formed during the reaction of the iron complex with EDTA and hydrogen peroxide.

For all samples fluorescein fluorescence intensity versus the logarithm of juice concentration was obtained. Studies were conducted at juice concentrations of 0.001–2%. Juice samples began to show antioxidant activity at a concentration of 0.001%. With a subsequent increase in the concentration of juices, an increase in the suppression of the action of free radicals and an increase in the fluorescence of fluorescein are observed. Juices containing cherries restored the fluorescein fluorescence to 81–97% (A_{\max}) at a concentration of 0.1–0.2% (Table 1). The IC_{50} – the juice concentration, at which 50% of the free radical inhibition is achieved is graphically determined. Juice (3) containing cherries and raspberries reached a peak of antioxidant activity at the lowest concentration – 0.1%, which is 2 times lower than the similar juice (1,2 and 4). The IC_{50} index of this juice was also minimal ($0.59 \cdot 10^{-2}$). A comparison of packaged juices with juice from fresh cherries is carried out. The A_{\max} value of cherry juice from fresh berries (6) is 1.9 and 1.65 times less than the similar parameters for packaged juices (1) and (2). A_{\max} index of sweet cherry juice (5) from fresh berries is 1.1 times less than the same figure for packaged juice (2). The IC_{50} index of juice (6) from fresh cherries is 14.8 and 19 times higher than for packaged juices (1) and (2). The IC_{50} index of juice from fresh berries of sweet cherry (5) is 5 times higher than the same figure for packaged juice (2). Since the composition of packaged juices includes sugar, which in itself is an antioxidant due to the presence of a large number of hydroxyl groups, which are traps of free radicals, it contributes to the antioxidant activity of these juices.

Table 1

Indicators of antioxidant activity of juices containing cherries

	Juices	A_{\max} , %	C_{\max} , %	$IC_{50} \cdot 10^{-2}$, %
1	cherry	97	0,2	0,89
2	cherry + cherry	84	0,2	0,69
3	cherry + raspberry	84	0,1	0,59
4	cherry + chokeberry + apple	81	0,2	1
5	cherry (juice from berries)	76	1	3,47
6	cherry (juice from berries)	51	0,2	13,2

Juice (1), containing a greater variety of berries: raspberries, black currants, chokeberry, strawberries, apples and grapes, has the highest A_{\max} (91%) (table 2). The lowest IC_{50} is obtained for juice (5), which contains, except raspberry, cranberries. Adding cranberries to raspberries increases the anti-radical activity of the juice to a greater extent. The antioxidant activity of juice from fresh raspberries (6) is significantly different from that of packaged juices. A_{\max} – in 1,3–1,4 times less, and IC_{50} – in 2,8 – 12,3 times more, which indicates lower antioxidant properties of juice from fresh berries.

Table 2

Indicators of antioxidant activity of juices containing raspberries

	Juices	A_{\max} , %	C_{\max} , %	$IC_{50} \cdot 10^{-2}$, %
1	raspberry + black currant + chokeberry + strawberry + apple + grapes	91	0,5	1,41
2	raspberry + apple + chokeberry	85	0,5	2,2
3	raspberry + cherry	84	0,1	0,59
4	raspberry + black currant + red currant	83	0,2	0,62
5	raspberries + cranberries	82	0,2	0,5
6	raspberry (juice from berries)	64	0,2	6,17

Juices containing strawberries restored the fluorescein fluorescence to 88-92% (A_{\max}) at a concentration of 0.5% (Table 3). The lowest IC_{50} is obtained for juice (2), which contains a greater number of different berries: strawberries, black currants, aronia, raspberry, apple and grapes. For juices (1) and (4) from different manufacturers having the same composition, similar IC_{50} values were obtained. The antioxidant activity of juice from fresh strawberries (5) is significantly different from that of packaged juices. A_{\max} – in 1,3-1,4 times less, and IC_{50} – in 4,4-6,2 times more, which indicates a lower antioxidant properties of juice from fresh berries.

Table 3

Indicators of antioxidant activity of juices containing strawberries

	Juices	A _{max} , %	C _{max} , %	IC ₅₀ ·10 ⁻² , %
1	strawberry + apple ("Odesski")	92	0,5	1,62
2	strawberry + chokeberry + raspberry + black currant + apple + grapes	91	0,5	1,41
3	strawberry + strawberry + chokeberry + apple	91	0,5	2
4	strawberry + apple ("Fruto nanya")	88	0,5	1,62
5	strawberries (juice from berries)	66	1	8,77

Due to the high content of flavonoids, the juices of berry crops can be considered highly effective inhibitors of free radicals. The increase in the variety of berries that make up the juice, leads to an increase in antioxidant activity, as it enriches the juice with various flavonoids.

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IMMUNOPHENOTYPIC CHARACTERISTICS OF PERIPHERAL BLOOD LYMPHOCYTES OF PATIENTS WITH SEVERE COMBINED IMMUNODEFICIENCIES

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Severe combined immunodeficiency – an extreme form of T-cell deficiency with or without B-cell deficiency and sometimes also low natural killer cell numbers, typically presents in infancy with pneumonitis, chronic diarrhea, and failure to thrive [1].

Keywords: severe combined immune deficiency, immunophenotype, T-, B-, NK-lymphocytes.

Severe combined immunodeficiencies (SCID) are the most life-threatening group of immunodeficiencies. Classical SCID is characterized by complete absence of T cells and the absence of other subsets lymphocytes depending on the genetic defect. In cases of immunodeficiencies atypical SCID with hypomorphic mutations T cell differentiation is partially maintained. The only effective method of therapy is substitution genetic defect of the immune system by transplantation of hematopoietic stem cells or gene therapy [2]. Without this treatment, the disease ends in a lethal outcome. In this regard, immunophenotypic characteristics of T- and B-lymphocytes in patients with SCID – is an actual trend in modern immunology.

Aim. To estimate the populations and subpopulations of peripheral blood lymphocytes in patients with SCID.

Materials and methods. The material for the study was the whole blood of SCID patients (patients with classical SCID (n=3), patients with atypical SCID (n=7)). Population and subpopulation of lymphocytes were determined by flow cytometry using monoclonal antibodies.

Results. The number of lymphocytes in the peripheral blood eight patients was within physiological values, one patient had lymphocytosis, and one had lymphocytopenia, when compared with the normal level. The physi-