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MEDICINE

THE STUDY OF CELLULAR FACTORS OF IMMUNITY IN PATIENTS WITH NON-HODGKIN'S LYMPHOMAS

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ABSTRACT

The purpose of this study was to study the basic cellular indicators of immunity in patients with non-Hodgkin's lymphomas to substantiate the immunopathogenetic features of the course of the disease. It turned out to be important that patients were divided into 2 groups with virus carrier and without virus carrier.

An analysis of the results allowed us to identify pronounced changes in the cellular immunity that manifested themselves by suppressing the expression of CD3 +, CD3 + CD4 +, IRI, against this background, an increase in the expression of CD3 + CD8 +, CD16 + and CD20 + B cells, as well as increased expression of activation molecular markers of CD38 + lymphocytes, CD95 +. Deep T-cell immunodeficiency was detected against the background of pathological activation of lymphocytes, which is clinically often reflected by frequent relapses, an unfavorable course of the disease, and treatment results.

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Non-Hodgkin's lymphomas (NHL) - a heterogeneous group of tumors of the blood system, characterized by various clinical course, localization, morphological, immunological; cytogenetic features, and results of therapy [12,16]. In recent years, the incidence of NHL has increased [6,10,13,15]. Men get sick about 3 times more often than women [1,2,4,7,9,9,14].

Cells of various morphoimmunological characteristics are the substrate of NHL, modern ideas about which allow us to rethink the basics of isolation! and the systematization of various options for NHL [1,5,7,8]. The last years of the development of oncohematology were marked by the emergence of new research methods: immunophenotyping, immunohistochemistry, molecular genetics, which along with morphological studies contributed to a deeper understanding of the pathogenetic mechanisms of the formation of NHL. This is reflected in modern classifications of lymphomas (classification of the European-American group for the study of lymphomas 1994., classification of tumors of the hematopoietic and lymphoid tissues of the WHO, 2001, 2008). The use of immunodiagnostics methods led to the isolation of T-, B- and cellular NHL, and within each group - several options (from immunologically immature and mature cells) [9,11,12,16]. Later, taking into account the expression of certain clusters of cell differentiation, some variants were transformed into separate nosological units: primary mediastinal (thymic) B-large cell lymphoma (BLCL), anaplastic large-cell lymphoma (LCL) positive and negative [1,2,4,7, 9.14]. In childhood, lymphoblastic lymphomas from progenitor cells (LBL) are most often diagnosed, and from mature cell NHL, Burkitt's lymphoma (BL), LCL characteristics of the tumor, in particular, the group. Only an integrated approach that takes into account the peculiarities of the morphological picture and uses an

expanded diagnostic immunological panel of antibodies, which is aimed at identifying not only the markers of mature T and B cells, but also the antigens of progenitor cells, makes it possible to correctly diagnose [4,5,7,10]. The main treatments for NHL remain polychemotherapy and radiation therapy. Isolation of new nosological forms in NHL group led to the emergence of various PCT programs followed by their gradual intensification (COP, COMP, LMB-81.84.86.89, NHL-BFM90 / 95) [12.16].

Based on the immunological characteristics of tumor cells, targeted drugs - monoclonal antibodies (anti-C020 - rituximab, zevalin, anti-CD22 - epratuzumab) have now begun to be used for therapeutic purposes. As a result of the use of modern therapy programs, the indicators of the overall, event-free and relapse-free survival of individuals with NHL have improved, reaching by now 85-91% [2.6]. The use of targeted therapy has improved B-NHL treatment outcomes. However, the problem of improving treatment, which directly depends on the state of the immune system, the presence and degree of secondary immunodeficiency, and the individual development of the disease, remains urgent.

At present, great attention is paid to the study of immunological mechanisms in the development and progression of lymphomas. An important issue remains the immunodiagnostics of cellular and humoral immunity. As the literature shows, publications devoted to the study of immunity are sporadic. Basically, articles are devoted to clinical study and the description of the results of treatment methods, while there are no works of a pathogenetic nature. Reliable data can only be obtained by analyzing a sufficiently large amount of clinical material, which makes it possible to study the frequency of occurrence of various NHL variants; comparison of clinical, morphological and immunological data, as well as treatment results for T- and B-cell lymphomas, which opens up the possibility of improving the diagnosis and individualization of chemotherapy programs depending on the immunophenotypic characteristics of tumor cells.

The aim of the study. To study the basic cellular indicators of immunity in patients with non-Hodgkin's lymphomas to substantiate the immunopathogenetic features of the course of the disease.

Materials and research methods. In our study, patients with non-Hodgkin's lymphomas (NHL) were divided into 2 groups: group I - patients with established virus carriers; group II - patients in the control group with no virus carrier. In the distribution of NHL patients by age, it was found that virus carriage leads to a rejuvenation of the disease: the peak incidence rate in group I is up to 30 years, while the same indicator for group II is over 50 years. The results of the analysis are presented in table 1.

Table 1. Distribution of patients by age and gender

Age, years	group I (virus carrier), n=23				group II (control), n=18			
	Men		Women		Men		Women	
	Abs	%	Abs	%	Abs	%	Abs	%
< 30	11	47,8±7,8	4	17,3±5,9	-		2	11,1±4,9
31-40	1	4,3±2,2	-		1	5,5±2,7	1	5,5±2,7
41-50	2	8,6±4,4	1	4,3±2,2	-		1	5,5±2,7
51-60	1	4,3±2,2	-		5	27,7±6,9	3	16,6±5,8
61-70	2	8,6±4,4	-		1	5,5±2,7	-	
> 70	1	4,3±2,2	-		3	16,6±5,8	1	5,5±2,7

The age of sick men with virus-bearing was 35.6 ± 4.56 years, among women - 27.2 ± 5.24 years, in the control group, the average age of men was 60.7 ± 3.80 years, women - $45.5 \pm 6, 97$ years old. The proportion of women in group I was $21.7 \pm 6.44\%$, men - $78.3 \pm 6.44\%$; in group II, women accounted for $44.4 \pm 7.75\%$, men - $55.6 \pm 7.75\%$.

In all patients, the diagnosis was established on the basis of data and the results of a comprehensive study (clinical, biochemical, radiological, ultrasound, CT, myelogram, morphological).

The lesion areas for non-Hodgkin's lymphomas in patients with viral infection (group I) most often occurred in the cervical and axillary I / nodes (more than 50%), then in the mediastinal, supraclavicular, retroperitoneal and inguinal (25-45%), the lesion was least noted. iliac I / nodes, spleen, Valdeyer (20% or less).

In control group II, the picture of lymph node lesions differed from the experimental group – patients with affected cervical I / nodes were more than 70%, while the remaining lesion zones were less common: axillary, supraclavicular, inguinal I / nodes malignantly transformed in 30-40% of cases; mediastinal, retroperitoneal, iliac - in less than 20% of cases; Valdeyer ring damage was observed in more than 60% of patients.

Thus, viral infection changes the picture of lymph node damage in patients with NHL in comparison with patients without viral load: in group I, axillary, mediastinal, supraclavicular, retroperitoneal, and retroperitoneal / inguinal 1 / nodes were transformed malignantly (25-45%). Group I patients were most often infected with HSV herpes simplex virus and Epstein-Barr virus (65-80%). Cytomegalovirus infection (CMV), human papilloma virus (HPV) in $43.4 \pm 7.7\%$ of patients, and Varicella-Zoster virus were found in $26.0 \pm 6.8\%$ and $8.6 \pm 4.4\%$, respectively.

The examination included patients undergoing examination in the chemotherapy department. All patients underwent clinical and laboratory blood tests, which included the study of a general analysis of blood and urine, biochemical and immunological parameters, as well as the blood coagulation system. Patients underwent a comprehensive clinical and instrumental examination aimed at clarifying the prevalence of the tumor process and identifying existing complications.

Immunological studies included the study of cellular and humoral parameters of the immune system of patients with OC. Determination of cellular immunity (CD3 +, CD3 + CD4 +, CD3 + CD8 +, CD16 +, CD20 +), as well as identification of activation markers of lymphocytes (CD25 +, CD38 + and CD95 +) was carried out by flow cytometry using Accuri C6 (USA) using monoclonal antibodies.

When conducting a statistical analysis of the data presented in the work, the results of the study were entered into databases prepared in the Microsoft Excel XP program. Numerical (continuous) values were presented as arithmetic means and mean errors ($M \pm m$). Comparison of quantitative characteristics was carried out using Student's criterion, for continuous variables - paired Student's criterion. $P < 0.05$ was taken as a boundary comparative criterion of statistical significance.

The obtained research results and their discussion. Thanks to the modern achievements of fundamental immunology, molecular biology, new biologically significant indicators have now appeared in the arsenal of researchers, which can help the practitioner, in particular in the diagnosis, treatment and prognosis of diseases, as well as in the choice of immunotropic therapy. In this regard, in recent years, much attention has been paid to immunological markers that can help in identifying an immunodeficiency state, diagnosing, predicting and preventing relapse of the disease, which is a kind of indicator of the nature of the course of the disease, especially in cancer [11,15].

The main factors of immunity that have been studied and will be presented below include cellular factors of immunity, such as population and subpopulation markers of lymphocytes. It should be noted that the listed immunity parameters are specific factors, but studying them against a specific nosology and comparing the results with the clinical manifestations of the disease are definitely important, specific value, because it is the elements of the immune system that accompany all processes of pathogenesis, the development of the disease, its progression and outcome. It is known that all malignant processes are related to immunodeficiency conditions, accompanied by immunosuppression of any parts of the immune system [6,13]. Therefore, the study of the immunoreactivity status of cancer patients is an important factor necessary to establish the depth of immunodeficiency, to predict the disease and, most importantly, to identify the most radical methods of therapy, including immunotropic therapy in the future.

The immunological parameters of patients with NHL were analyzed before the start of complex treatment to identify pathogenetic characteristics of the response. Analysis of the results showed that the average content of leukocytes in peripheral blood in all groups of patients was reduced compared with the value of the control group.

Moreover, a significant decrease in the content of leukocytes was detected in groups of patients before treatment compared with data from a group of practically healthy individuals. The highest leukocyte count was detected in the group of patients and amounted to $6280.9 \pm 280.7 \text{cl} / \mu\text{l}$. The study of the relative content of the total pool of lymphocytes between the studied groups of patients showed that the number of lymphocytes was significantly suppressed in the group of patients compared with the value of the control group. It was found that the most significantly low value of lymphocytes was observed in groups of patients before treatment with virus carrier. So, the level of lymphocytes in the group of patients with virus carrier was $29.3 \pm 1.2\%$, while in the control group it was $33.8 \pm 1.11\%$.

It was found that phenotypic markers of lymphocytes include such markers as CD3 +, CD3 + CD4 +, CD3 + CD8 +, CD20 +. It is widely shown in the literature that the triggering and regulation of the effectiveness of the immune response is largely determined by the specific antigen of T-lymphocytes. Responsible for this function are antigen-recognizing receptors - TCR. It is known that the degree of surface expression of CD3 + receptors on the membrane of T-lymphocytes reflects its transmissible function and allows to identify the total number of T-lymphocytes [3,12]. Thus, the analysis of the immunophenotype of CD3 + T-lymphocytes in patients with NHL showed that the presence of a reliable suppression of the

expression of CD3 + on T-lymphocytes is observed in all groups of patients compared with data from a practically healthy group ($p < 0.05$). The lowest CD3 + value was observed in the group of patients with virus carriers before chemotherapy. Obviously, a decrease in the total pool of T-lymphocytes (CD3 +) was observed mainly due to the suppression of the expression of CD3 + CD4 +. A study of the expression of CD3 + CD4 + on T-lymphocytes, which are the main regulatory cells of the immune system, showed that the lowest value was noted in groups of patients before treatment ($p < 0.05$). The expression of CD3 + CD4 + was most suppressed in the group of patients with NHL with virus carrier. It has been shown in the literature that the CD4 + T-cell response to tumor proteins is an important cellular defense mechanism of the macroorganism, since CD4 + T-helpers stimulate antibody production by B-lymphocytes and activate CD8 + T-lymphocytes specific for tumor cells [2,5, 7,9,13]. The analysis showed that in the group of patients with virus-bearing CD3 + CD4 + it was $21.4 \pm 1.3\%$, while in the groups of patients without virus-bearing it was $25.8 \pm 0.8\%$, and in the group of practically healthy individuals it was $35.7 \pm 1.14\%$.

Cytotoxic CD3 + CD8 + T-lymphocytes play an important role in the pathogenesis of cancer [4,8]. It is proved that the function of these cells is the recognition of antigens on the cell surface in combination with MHC class 1 molecules. Since they are present on almost all nuclear cells of the body, any cell carrying MHC class 1 molecules in combination with an antigenic peptide can activate a clone of cytotoxic T lymphocytes. The biological role of this activation is the removal of mutant cells [4,9]. CD3 + CD8 + T-lymphocytes play a major role in the elimination of the virus, which is caused, on the one hand, by their ability to cause the death of infected cells expressing the corresponding peptides presented by MHC class 1 molecules, and, on the other hand, the ability to secrete antitumor factors - cytokines [4, 7, 11, 16].

Analysis of the expression of CD3 + CD8 + on T-lymphocytes revealed a significant increase in all groups of patients compared with the value of the control group. It should be noted that the maximum increase in CD3 + CD8 + was detected in the group of patients before treatment ($p < 0.05$). An analysis of the values of CD3 + CD8 + on T-lymphocytes between the studied groups of patients shows that before treatment, the expression of CD3 + CD8 + was significantly increased and amounted to $37.9 \pm 1.72\%$. The immunoregulatory index (IRI), which is the ratio of the values of CD3 + CD4 + / CD3 + CD8 +, is of significant importance in secondary immunodeficiency states. It is known that in normal IRI in healthy individuals averages 1.62 ± 0.02 . Obviously, suppression of the expression of CD3 + CD4 + against the background of increased expression of CD3 + CD8 + leads to a decrease in IRI. According to our data, the lowest decrease in IRI is observed in the group of patients before treatment with virus-bearing compared with the data of patients without virus-bearing ($p < 0.05$). Therefore, pronounced immunosuppression was characteristic of patients with NHL in groups of patients before treatment with virus carrier. Apparently, a decrease in IRI is an important criterion for the depth of the T - cell immunodeficiency state, especially against the background of infection with latent chronic viruses.

Further, the expression of killer cells, which are the third population of lymphocytes providing maintenance of genetic homeostasis, which are phenotypically and functionally significantly different from T and B lymphocytes, was studied [5,8]. Killer lymphocytes belong to the category of the main effectors of natural or innate immunity, which are able to lyse target cells or carry out antibody-dependent cellular cytotoxicity. They perform the functions of the first line of defense before immune T-lymphocytes and specific antibodies arise [5,7]. Killer cells with CD16 + phenotypes were studied. A significant increase in the expression of CD16 + was revealed in all groups of patients. It was shown that the highest expression of CD16 + is observed in the group of patients with virus carrier ($p < 0.05$). So, in the group of patients before treatment, the expression of CD16 + was $27.6 \pm 1.1\%$, in the control group (without virus carrier) - $24.5 \pm 1.31\%$, in the group of practically healthy individuals - $16.7 \pm 1.4\%$. Consequently, the highest expression of CD16 + was observed in groups of patients prior to the start of chemotherapy with virus carrier.

A study of the expression of CD20 + on B-lymphocytes, which are the main regulatory cells of the immune system and are important in the development of humoral immunity, showed that the expression of CD20 + was significantly increased in all groups of patients ($p < 0.05$). Despite this, the study of the content of B-lymphocytes is an important criterion to assess the depth of immunodeficiency and determine the next steps in terms of diagnosis and treatment. Next, activation markers of peripheral blood lymphocytes were studied. It is known that the activation markers of lymphocytes began to be studied relatively recently, therefore, small works on the functional activity of activation markers of lymphocytes, in particular in oncological processes, have been reported in the literature [15,16]. From the available literature data, it is clear that the study of activation markers of lymphocytes, especially in proliferative processes, is of great scientific and practical importance. analysis of activation markers of lymphocytes allows one to study the processes of activation, proliferation, differentiation, and apoptosis of immunocompetent cells and characterizes cell cycles associated

with these processes [6,7]. So, we studied lymphocyte markers such as CD38 + and CD95 +. It is known that CD38 + is an activation marker represented by a transmembrane glycoprotein, which is considered as a multifunctional protein [14,16]. The enzymatic functions of CD38 + provide its main immunoregulatory role; this is the binding of various agents to this receptor, which enhances the synthesis of cytokines, activation of kinases, and protein phosphorylation [6, 9]. CD38 + is expressed on immature T- and B-lymphocytes, activated T-lymphocytes, plasmocytes [15]. Analysis of the expression of CD38 + on lymphocytes revealed a significant increase in this marker in groups of patients before treatment. The highest value of CD38 + was observed in groups of patients before treatment with virus carrier. The expression of CD38 + before treatment was $33.2 \pm 1.7\%$, without virus carrier - $28.4 \pm 1.5\%$, and normal - $23.4 \pm 0.6\%$. Therefore, increased expression of CD38 + was observed before the treatment of patients, which is apparently associated with the proliferative activity of specific T and B lymphocytes in response to the malignant process and chronic virus carriage. Also, increased expression of CD38 + may be associated with activation of CD3 + CD8 +, CD16 + and CD20 +. According to published data, there is information about the role of APO-1 / Fas (CD95 +) receptors in the process of apoptosis, and its degree is a reflection of the level of lymphocyte apoptosis [3,6]. It has been established that an increase in the expression of CD95 + receptors on lymphocytes indicates an excessive and ineffective process of stimulating blood lymphocytes, which indicates an apoptotic pathway for the death of lymphocytes [16]. Binding of CD95 + to the Fas ligand induces apoptosis of cells expressing CD95 +. The analysis showed that in groups of patients increased expression of CD95 + is noted. Moreover, the greatest expression is observed in groups of patients before treatment with virus carrier. Apparently, excessive apoptosis in combination with the activation of the humoral immunity and deep T-cell immunodeficiency contribute to the progression of the disease.

Thus, the analysis of the results allowed us to identify pronounced changes in the cellular component of immunity, which are manifested by a suppression of the expression of CD3 +, CD3 + CD4 +, IRI, increased expression of CD3 + CD8 +, CD16 + and CD20 + cells, as well as increased expression of CD38 +, CD95 +.

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PARALLEL STUDY OF HEMORHEOLOGICAL, INFLAMMATION AND ANEMIA PARAMETERS BEFORE, DURING AND AFTER SURGERY IN PATIENTS WITH STOMACH CANCER

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ABSTRACT

The aim of our work was to study the biomechanical markers of blood flow in patients with stomach cancer. Therefore, we paid attention to the parameters of hemorheology, rheology, inflammation and anemia in the group of patients with stomach cancer and in the control group; with the help of a new surgical technique, we simultaneously examined the flow parameters in the central blood and locally at the site of tumor growth during the operation. As a result of the matrix analysis and statistical data processing, it turned out that in the group of patients the average values of hemorheological parameters went beyond the limits of the clinical norm and significantly differed from the parameters in the control group. Moreover, the parameters of inflammation and anemia also differed in the group of patients from the values of the control group, but with a little difference. Consequently, the parameters of hemorheology, inflammation, and the parameters that determine the presence of anemia are variable in the local circulation as compared to the central one, mainly due to the hemorheological component.

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Introduction. Stomach cancer is a cancer, which develops from the lining of the stomach. There are early symptoms (heartburn, upper abdominal pain, nausea and loss of appetite) and later symptoms (weight loss, yellowing of the skin and whites of the eyes, vomiting, difficulty swallowing and blood in the stool). The cancer may spread from the stomach to other parts of the body [1]. Most of the time, stomach cancer develops in stages over years [2]. Diagnosis is usually by biopsy done during endoscopy [3]. Medical imaging to determine if the disease has spread to other parts of the body [3] follows this. Treatments may include some combination of surgery, chemotherapy, radiation therapy and targeted therapy [3,4]. If treated late, palliative care may be advised [2]. Globally, stomach cancer is the fifth leading cause of cancer and the third leading cause of death from cancer, making up 7% of cases and 9% of deaths [5]. These data indicate the relevance of the topic. We looked at the problems in the new perspective. The aim of our work was to study the biomechanical markers of blood flow in patients with stomach cancer. Therefore, we paid attention to the parameters

of hemorheology, rheology, inflammation and anemia in the group of patients with stomach cancer and in the control group.

Materials and methods. We examined 3 men, with stomach cancer. The diagnosis of stomach cancer was made by studying the morphology by a microscope. All patients were prescribed surgery in accordance with the medical therapeutic standard. Their average age was 62 ± 2.08 years. The duration of the disease could not be identified, since the inclusion of patients in our group was carried out immediately after diagnosis. From the moment of diagnosing cancer prior to the operation, standard studies were carried out in patients, approved by the Ministry of Labor, Health and Social Protection of Georgia. All patients had positive rhesus and the first blood group. We investigated the parameters determining the rheological state of the blood, the presence of anemia and inflammation as biomechanical determinants of the blood flow. Specifically erythrocytes aggregation index (EAI), erythrocytes deformation index (EDI), blood plasma viscosity (IBP) and HCT, ESR, WBC, FB, CRP, HGB, RBC, MCV, MCH. We investigated these parameters: 1) in patients before the surgery 2 hours prior to the premedication in v. cubital is; 2) during the operation in - a) the local blood flow of the patient in v. Spleen Potrae and b) in the central circulation in v.Cubitalis of a patient. We investigated in analogical parameters in the simples of blood from v.Cubitalis in control group. Blood from v.Cubitalis blood was collected in accordance with laboratory standards. We proposed an innovative method for studying the fluidity of blood directly at the tumor growth point, in order to study the local blood flow during surgery. In this regard, we took blood locally from v. Spleen Portae. Firstly, we conducted a revision of the entrance to the spleen and nearby lymph nodes, mobilized gastro-spleen yogi, founding an artery and vein at the same time. The vein was taken into two ligatures and blood was taken respectively. For control, we selected three healthy men of respective age and weight, with the first positive blood group, in which we conducted similar studies that were conducted in our patients before surgery. We took the informational consent in both of patients and persons in control group in accordance with the International Standards [6], the form of which was specially prepared by our organizations and approved by the Ethical Committee of the I. Beritashvili Center for Experimental Studies of Biomedicine. We used the optimized texture analysis method "Tas-plas" [7] Leits, Germany) to determine the rheological parameters. The statistical analysis was carried out by the "Origin 8.1 for IoS" statistical processing program (USA).

Results. Our studies showed that in the group of patients, the average values of hemorheological parameters went beyond the limits of the clinical norm and significantly differed from the parameters in the control group. The parameters of inflammation and anemia also differed in the group of patients from the values in the control group, but with a lesser percentage degree, which was unreliable as well. According to our data, the parameters of hemorheology, inflammation, and determining the presence of anemia are variable in the local circulation as compared with the central one, mainly due to the hemorheological component. The data of all parameters are in Table #1.

Table 1. Parameters of hemorheology, inflammation, anemia in patients group and in control group. (M±m).

	Hemorheological Parameters				Inflammation Parameters				Parameters of Anemia			
	EAI,%	EDI,%	IBV, sP	Hct,%	ESR, %	WBC, 10 ⁹ /l	CRP, mg/l	FBg/l	HGB,g/l	RBC, 10 ¹²	MCV	MCH, g/l/hgb
Patients: V.Cubitalis	39±3,4	2.2±0.05	1.35±0.02	42±3,4	25±2,2	6.6±1.1	7±0	513±23	121±5	4.84±0.1	88.5±2.0	25.03±1.1
Control: V.Cubitalis	28±2,5	2.1±0.05	1.2±0.02	43±5,4	8±1.0	4,3±1.2	4±0,5	350±53	95±10	4±1.2	81±1.2	23±2.2

Discussions. Our studies showed that before the operation in blood taken from v.cubitalis, the average values of rheological parameters, parameters of inflammation and anemia in patients with cancer differed compared with the corresponding parameters of the control group, however some of them ranged within the existing clinical and therapeutic standards. We found that the average values differed from each other in cancer patients during surgery, in blood samples taken from v.cubitalis and

v.spleen potrae. Moreover, average values of the studied parameters of blood samples taken from v.cubitalis corresponded to the average values of similar parameters in blood samples before the operation, which may mean that the studied factors are resistant to anesthesia and other stressors that affect the body in the operation. This speaks in favor to the tactics and algorithm of the surgical intervention itself for stomach cancer. However, our main goal was to study the biomechanical changes in the fluidity of central blood and locally in the area of neoplasms. In order to describe mathematically the biomechanical changes, the clinical data of which we presented in the “Results” section of this article, we reviewed the data area. This is the 12-factor set (EAI, EDI, IBV, HCT, ESR, WBC, FB, CRP, HGB, RBC, MCV, MCH) for 2 degrees of freedom (blood from v.Cubitalis and blood from v. Spleen portae) in the case of n patients (3 patients). We will create matrixes [8], the elements of which will correspond to the difference between the measured parameters in the local and central blood, while maintaining the y sign to all patients during the operation for: A) hemorheological parameters; B) for the parameters of inflammation; C) for parameters determining anemia in the same patients. In matrix A are following data $EAI_c - EAI_s$, when EAI_c is EAI_s in blood samples from v.Cubitalis and EAI_s is EAI in v. Spleen Potrae in the columns for all patients separately (the first column is patient # 1; the second column is patient # 2; the third article is patient # 3). Index “_c” and “_s” we used in all parameters for show, when we take blood: in V.Cubitalis or V. Portal Spleen. In matrix B, data are presented $EAI_c - EAI_s$, etc. in columns for all patients individually (the first column is patient # 1; the second column is patient # 2; the third article is patient # 3). Matrix C presents data $EAI_c - EAI_s$, ect. in columns for all patients individually (the first column is patient # 1; the second column is patient # 2; the third article is patient # 3).

We make matrixes I, II, III. This is three matrixes.

I	10	1	1	5	II	22	0	22	0	III	3	0	2	0
	15	1	1	5		2	0	13	12		12	0	0	0
	8	1	1	12		10	0	31	85		20	2	0	2

We calculated the ranks of the matrixes. The rank of all matrixes equals to 3rd. Next, we laid them skeletal in A_I, A_{II}, A_{III} .

This is matrix I equals A_I .

$A_I =$	10	1	1	5	$P =$	0	0	1	$Q =$	15	1	1	5
	15	1	1	5		1	0	0		8	1	1	12
	8	1	1	12		0	1	0		10	1	1	5

This is matrix II equals A_{II} .

$A_{II} =$	22	0	22	0	$P =$	0	0	1	$Q =$	15	1	1	5
	2	0	13	12		1	0	0		8	1	1	12
	10	0	31	85		0	1	0		10	1	1	5

This is matrix III equals A_{III} .

$A_{III} =$	3	0	2	0	$P =$	0	0	1	$Q =$	20	2	0	2
	12	0	0	0		1	0	0		12	0	0	0
	20	2	0	2		0	1	0		3	0	2	0

The rows of the single matrix are linearly independent.

The nature of the linear dependences of the matrix does not change with a random transposition of its rows or columns. According to the existing theorems of mathematical operations on matrixes, rows of a matrix are dependent only if one of them is a linear combination of the other rows and if some of the lines are linearly dependent, then all of them are linearly dependent. Consequently, if there is a zero row among the rows of the matrix, then these rows are linearly dependent, and if there are proportional rows among the rows of the matrix, then all of them are linearly dependent. Based on this, it is clearly seen that the linear dependence of the parameters exists only in the hemorheological component of blood fluidity. We will try to explain this, relying on the physiological features of the blood and its' circulation. Blood is inhomogeneous; it circulates in the systems of micro and macro-circulation, having its own patterns. The continuity of movement is provided by the pressure gradient at the ends of the vessels and resistance, which

is overcome by the blood flow. Under normal physiological conditions, the blood flow is characterized by comparative constancy and compensatory adequacy. However, with all pathophysiological abnormalities, this process is disturbed. This is especially noticeable in oncological diseases, when resistance to blood flow is caused not only by changes in the composition of blood and plasma, but also by mechanical barriers. From the mechanics of blood flow point of view (not to be confused with the mechanics of blood circulation), we paid attention to the set of factors that are most important for the clinic of stomach cancer. These are hemorheological factors, factors of inflammation, factors that cause an anemic condition or, on the contrary, hyperhemoglobinemia. Blood flow is ensured by two parallel systems (on the one hand, it is rheological, and on the other hand, it is coagulative-anticoagulation). The question may arise: why we did not consider the parameters of the hemostasiogram in our work (coagulogram). As for the standards proposed for the treatment of stomach cancer, as well as other operable cancer diseases, on the day of cancer diagnosis in order to prevent operative and postoperative complications, anticoagulation therapy is prescribed to patients, regardless whether the patient's coagulation system is impaired or not. We do not focus on coagulation mechanisms in this work, since we cannot identify them with reality in view of the anticoagulant therapy received by patients in accordance with accepted standards of treatment of such patients. However, we investigated the adjacent parameter (FIB), which is one of the anticoagulant factors that in the scientific literature is often identified with inflammatory processes [9]. Fibrinogen under the influence of exocoagulants is the most static of the parameters of hemostasiology, so it can be determined as a factor of inflammation. According to the laws of theoretical biomedicine, resistance and pressure difference at the ends of blood vessels act as a basis of blood circulation. The resistance to blood flow depends on the nature of the blood flow - turbulent or laminar. Under conditions of physiological rest in almost all parts of the circulatory system, laminar flow, i.e. a layered blood flow, is observed without turbulence and layer mixing. A plasma layer is located near the vessel wall, the speed of which is limited by the fixed surface of the vessel wall, and the layer of erythrocytes moves along the axis at high speed. The layers slide against each other, which creates resistance (friction) for the blood flow as a heterogeneous fluid. Shear stress arises between the layers, inhibiting the movement of the faster layer. According to our data, the parameters studied in regional networks and in the general blood circulation differed from each other. We found a particular difference in hemorheological parameters. Apparently, this is due to the diameter and angle of separation of the branch from the main artery; it may change the ratio of the volume of formed elements and plasma. This is due to the fact that in parietal blood layer there is a greater proportion of plasma, and in the axial - red blood cells, therefore, in the dichotomous division of the vessel, a smaller branch or branch that extending at a right angle receives blood with a high plasma content. The viscosity of moving blood varies depending on the nature of the blood flow and the diameter of the vessels. The length of the vessel does not have a special meaning as a factor affecting the blood flow, because we take blood directly during the operation not from the pool of the abdominal cavity, but from the leading artery. Turbulent flow is characterized by twists, while the blood moves not only parallel to the axis of the vessel, but also perpendicular. Turbulent flow is observed in the proximal sections of aorta and pulmonary trunk during the expulsion of blood from the heart, local turbulence can be created in places of branching and narrowing of the arteries, in the area of sharp bends of the arteries. The movement of blood can become turbulent in all large arteries with an increase in the volumetric blood flow velocity (for example, with intensive muscular work) or with severe anemia. Turbulent movement significantly increases the internal friction of blood, and for its advancement, much more pressure is required. Hemorheological parameters in the local blood were significantly changed compared with those in the central circulation, whereas the parameters of inflammation and determining the anemic state remained equivalent locally and centrally. This suggests that from the biomechanics point of view it is the rheological parameters that are responsible for the fluidity of the blood, which determines the condition of the patient in the postoperative period. The postoperative period determines the outcome of treatment of such patients. Rheological parameters are responsible for resistance and even for the total length of the vessels. In view of the rheology laws, small-caliber vessels are often blinded, especially during pathological processes. Sometimes, on the contrary, angiogenesis occurs, anastomoses grow, new small vessels open and the length of the common network of blood vessels increases. But as we indicated above in our specific cases, the Δ length of a specific vessel can be neglected, because we take blood directly from the adducting artery during the operation. The process of taking blood directly from the artery during the operation is our technical knowhow. This is the most optimal method to monitor several body systems simultaneously at the site of tumor growth [10, 11]. Our proposed tactics do not increase the duration of the operation, the risks of complications remain unchanged. Blood circulation of the organ itself does not change due to the small size of a vessel. The obliteration of the vessel produced by us is the prevention of local bleeding, thrombosis, and stasis. It

would be appropriate to continue research in this direction, to investigate a large cohort of patients, not only before/during the operation, but also in the postoperative period. We hope that our joint research of hemorheological, inflammatory parameters, as well as of the parameters that determine anemia in patients who suffer from a stomach cancer, will initiate multidisciplinary research. For the first time in this article, we were able, to determine the variability of blood flow in the central and local blood circulation during stomach cancer, by means of elementary mathematical transformations, to find out which system provides this change. Our findings are based on basic knowledge of biomedicine blood circulation in cancer diseases and are based on mathematical determinants.

Conclusions. You can list only a number of assumptions about the most likely stimuli and manifestations of the disease, but none of them can act separately, in each case we should speak about a complex of possible factors that have not yet been fully studied in the context of multidisciplinary biomechanics and biomedicine. In this article, for the first time, we were able to determine the variability of blood flow in the central and local blood circulation during stomach cancer, by means of elementary mathematical transformations, in order to find out which system provides this kind of change. Our findings are based on basic knowledge in the sphere such as biomedicine, blood circulation in cancer diseases and are based on mathematical determinants.

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THE STUDY OF HUMORAL FACTORS OF ADAPTIVE IMMUNITY IN PATIENTS WITH NON-HODGKIN'S LYMPHOMAS

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ABSTRACT

It is known that humoral factors of immunity play an important function of mediators in the cascade development of the immune response and can determine the effectiveness of the final, effector reactions of cellular immunity in the inactivation and elimination of antigens. Serum concentrations of major immunoglobulins IgG, IgA, IgM in NHL were analyzed. The highest serum content of IgG and IgA was revealed in the groups of patients with virus carrier. It has been established that one of the most important humoral markers of immunity is the circulating immune complexes (CIC). It has been established that one of the most important biological functions of immunoglobulins is antigen binding and the formation of CIC. A high level of CIC in NHL may be due not only to the activation of the immune response, but also to the suppression of the mechanisms of their elimination. Therefore, based on the results obtained, with NHL there is a pronounced imbalance of humoral immunity. CIC of large and small sizes are also increased, however, the highest increase in CIC was observed in groups of patients before chemotherapy with virus-bearing. An increase in the main immunoglobulins indicates the presence of humoral imbalance, and an increase in the CIC indicates the presence of intoxication of the body either due to the decay of the tumor cells themselves and infected cells, which almost always indicates the progression of the pathological process.

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Despite a significant deepening in the last decade of ideas in the etiology, immunopathogenesis, course and progression of malignant processes, many questions regarding the mechanisms of the development of the pathological process and its course, evaluation of treatment effectiveness, remain open [10,12]. Moreover, in recent years, many etiopathogenetic factors, such as viruses, which have a pronounced carcinogenic factor, have been understood. So, an important role in the course and effectiveness of therapy for lymphomas belongs to the cellular and humoral factors of the immune system [4,7].

At present, great attention is paid to the study of immunological mechanisms in the development and progression of lymphomas. An important issue remains the immunodiagnostics of cellular and humoral immunity. As the literature shows, publications devoted to the study of immunity are sporadic. Basically, articles are devoted to clinical study and the description of the results of treatment methods, while there are no works of a pathogenetic nature. Reliable data can only be

obtained by analyzing a sufficiently large amount of clinical material that makes it possible to study the frequency of occurrence of various NHL variants; comparison of clinical, morphological and immunological data, as well as the results of treatment of T- and B-cell lymphomas, which opens up the possibility of improving the diagnosis and individualization of chemotherapy programs depending on the immunophenotypic characteristics of tumor cells [1,3,8,12].

Based on the foregoing, we evaluated the humoral factors of the immune system in patients with NHL depending on the virus carrier.

Purpose of the study. To study the main humoral parameters of immunity in patients with non-Hodgkin's lymphomas in order to understand the etiopathogenetic features of the course of the disease.

Materials and research methods. In our study, patients with non-Hodgkin's lymphomas (NHL) were divided into 2 groups: group I - patients with established virus carriers; group II - patients in the control group with no virus carrier. In the distribution of NHL patients by age, it was found that virus carriage leads to a rejuvenation of the disease: the peak incidence rate in group I is up to 30 years, while the same indicator for group II is over 50 years. In sick men with virus carriers, the average age was 35.6 ± 4.56 years, among women - 27.2 ± 5.24 years, in the control group, the average age of men was 60.7 ± 3.80 years, women - 45.5 ± 6.97 years. The proportion of women in group I was $21.7 \pm 6.44\%$, men - $78.3 \pm 6.44\%$; in group II, women accounted for $44.4 \pm 7.75\%$, men - $55.6 \pm 7.75\%$.

In all patients, the diagnosis was established on the basis of data and the results of a comprehensive study (clinical, biochemical, radiological, ultrasound, CT, myelogram, morphological).

The lesion zones for non-Hodgkin lymphomas in patients with viral infection (group I) most often occurred in the neck and axillary lymph nodes (more than 50%), then in the mediastinal, supraclavicular, retroperitoneal and inguinal (25-45%), the least significant was the defeat of the iliac 1 / nodes, spleen, Valdeyer (20% or less).

In control group II, the picture of lymph node lesions differed from the experimental group — patients with affected cervical 1 / nodes were more than 70%, while the remaining lesion zones were less common: axillary, supraclavicular, inguinal 1 / nodes malignantly transformed in 30-40% of cases; mediastinal, retroperitoneal, iliac - in less than 20% of cases; Valdeyer ring damage was observed in more than 60% of patients. Viral infection changes the picture of lymph node damage in patients with NHL in comparison with patients without viral load: in group I, axillary, mediastinal, supraclavicular, retroperitoneal, and inguinal 1 / nodes were transformed malignantly (25-45%). Group I patients were most often infected with HSV herpes simplex virus and Epstein-Barr virus (65-80%). Cytomegalovirus infection (CMV), human papilloma virus (HPV) in $43.4 \pm 7.7\%$ of patients, and Varicella-Zoster virus were found in $26.0 \pm 6.8\%$ and $8.6 \pm 4.4\%$, respectively. The examination included patients undergoing examination in the chemotherapy department. All patients underwent clinical and laboratory blood tests, which included the study of a general analysis of blood and urine, biochemical and immunological parameters, as well as the blood coagulation system. Patients underwent a comprehensive clinical and instrumental examination aimed at clarifying the prevalence of the tumor process and identifying existing complications.

Immunological studies included the study of the humoral parameters of the immune system of patients. The humoral immunity parameters were determined by studying the main immunoglobulins A, M, G using commercial test systems for enzyme-linked immunosorbent assay produced by "Human", Germany.

When conducting a statistical analysis of the data presented in the work, the results of the study were entered into databases prepared in the Microsoft Excel XP program. Numerical (continuous) values were presented as arithmetic means and mean errors ($M \pm m$). Comparison of quantitative characteristics was carried out using Student's criterion, for continuous variables - paired Student's criterion. $P < 0.05$ was taken as a boundary comparative criterion of statistical significance.

The obtained research results and their discussion.

It has been established that the functional usefulness of B-lymphocytes in the immune response is characterized by the production of immunoglobulins [10,12]. It is known that immunoglobulins play an important function of mediators in the cascade development of the immune response and can partly determine the effectiveness of the final, effector responses of cellular immunity in the inactivation and elimination of antigens [7,8]. It is also known that circulating antibodies are one of the effector factors of immunity, which provides antigen-specific protection [1,3,4,8]. We have analyzed the serum concentrations of the main immunoglobulins IgG, IgA, IgM in NHL. As can be seen from the data presented, the content of the main serum immunoglobulins varied widely. The highest serum IgG content was detected in the group of patients before treatment without virus carrier, and the lowest content was noted in the group of patients with virus carrier, that is, due to

a factor that suppresses immunity. The serum IgM content in almost all groups of patients with NHL was within the normative values, and there were no specific deviations between the groups of patients. Thus, the serum IgG content in the group of patients before treatment with virus-bearing was 1374.5 ± 46.4 mg%, in the group of patients without virus-bearing - 1287.9 ± 56.8 mg%, with a standard value of 1148.5 ± 35.6 mg%. Analysis of IgA content revealed the presence of a significant increase in serum IgA in all groups of patients with NHL. Moreover, the highest content was noted in the group of patients with virus carrier. Consequently, the humoral immunity was characterized by an increase in serum concentrations of IgG and IgA in groups of patients with NHL.

One of the most important humoral markers of immunity is the circulating immune complexes (CICs). It has been established that one of the most important biological functions of immunoglobulins is antigen binding and the formation of CICs [6,12]. An important characteristic of the CIC is their size, which can be large and small. The analysis showed that the CIC of large and small sizes in all groups of patients were significantly increased. So, the CIC of large quantities were significantly increased before treatment. As for the CIC of small quantities, a significant increased content is also observed. The highest average value of small CIC was revealed in groups of patients before treatment and after treatment without immunotherapy. Apparently, this is due to the lack of necessary detoxification and effects on the functioning of the immune system. Also, a CIC of 4% of small values are observed, the smallest value close to normal in the group of patients without virus carrier. It is known that CIC3% of large quantities formed with an excess of antibodies, although they are able to bind complement, are large, insoluble, quickly phagocytized and have low pathogenicity [2,3,5]. The greatest pathological potential is possessed by soluble immune complexes of small sizes, which were formed with an excess of antigen [4,7]. A high level of CIC can be caused not only by activation of the immune response, but also by suppression of the mechanisms of their elimination [2,6,10,11]. The latter, apparently, is associated with a weakening of the function of the cells of the monocyte-macrophage system - cells that absorb and disintegrate the immune complexes. Therefore, activation of the humoral immunity is observed along with severe depression of the cellular immunity.

Thus, based on the results obtained, it is seen that with NHL there is a pronounced imbalance of humoral immunity. CIC of large and small sizes are also increased, however, the largest increase in CIC was observed in groups of patients prior to chemotherapy with virus-bearing compared with data from patients without virus-bearing. An increase in major immunoglobulins indicates the presence of humoral imbalance, and an increase in CIC indicates intoxication of the body either due to the decay of the tumor cells themselves and infected cells. An increase in CIC of 4% always indicates the progression of the pathological process and is a marker of the progression or worsening of the clinical course. CIC3% quickly disintegrate in the body, so they have no pathological potential.

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РАСПРОСТРАНЕННОСТЬ КИШЕЧНЫХ ПАРАЗИТОВ У ВИЧ-ПОЗИТИВНЫХ ПАЦИЕНТОВ

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ABSTRACT

A cross-sectional study among people living with HIV (PLHIV), who are naive and who are on antiretroviral treatment (ART) was conducted in Kyiv, Ukraine from January 2017 to June 2019. In 200 samples of feces from PLHIV were detection intestinal parasites and helminthes. Also in all patients was measure of CD4 T cells by flow cytometry technique and the viral load of HIV (HIV VL) by reverse transcription and polymerase chain reaction, sensitivity of test – 40 copies HIV RNA / ml. The study shows high prevalence of intestinal parasitic in population of PLHIV – 30,0%. The most prevalent parasites were Cryptosporidium (10,5%), Ascaris lumbricoides (1,5%), G. lamblia (0,5%). Opportunistic protozoans (B. Hominis) were found in 15.5% of PLHIV. Among PLHIV with intestinal parasites severe immunosuppression (< 200 CD4 cells/ml) were more common (66.7%) than among PLHIV without intestinal parasites (45.7%); patients with undetectable HIV VL (35.0%), patients receiving ART for more than 6 months (28.3%) were less common (55.7% and 54.3% respectively). In all cases P value was less than 0.05. Our data show that detection even opportunistic intestinal protozoans in PLHIV can be used as a marker of immune suppression and HIV replication activity, and confirms the importance of parasitological surveillance in this group of patients.

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Введение. Примерно 30-60% людей, живущих с ВИЧ (ЛЖВ) в развитых странах и 90% в развивающихся страдают диареей [1], нередко обусловленной кишечными паразитами. Известно, что риск возникновения паразитарных инвазий, как и других кишечных инфекций, в первую очередь связан с несоблюдением санитарно-гигиенических норм, ограниченным доступом к воде, жарким климатом. Регионы с высоким уровнем распространенности ВИЧ-инфекции в большинстве своем, также являются зонами риска по распространенности кишечных инфекций и инвазий поэтому наибольшая частота ко-инфекций ВИЧ+паразитозы отмечается в странах Африканского континента, в основном в субэкваториальной Африке. Вероятно, по этой причине большинство работ, посвященных изучению кишечных паразитозов у ЛЖВ, было проведено в этом регионе [2, 3, 4].

Наиболее распространенным среди ЛЖВ паразитозом является криптоспоридиоз [5,6]. Поскольку иммунодефицитные состояния повышают риск развития клинических проявлений при инфекциях и инвазиях, вызванных условно патогенными паразитами, у ЛЖВ часто выявляют оппортунистических паразитов, которые являются причиной кишечных расстройств,

анемии, персистирующей диареи и даже смерти пациентов. По данным большинства исследователей, кишечные паразитозы отмечают у ЛЖВ с низким количеством CD4 Т клеток (<350 кл/мкл). В то же время, Tave B. et al. [7] не установили корреляции между уровнем CD4 и частотой выявления кишечных паразитов. Несмотря на практически однозначные данные, полученные разными авторами [8, 9, 10] о позитивном влиянии антиретровирусной терапии (АРТ) на инвазированность кишечными паразитами ЛЖВ, в исследовании, проведенном в Камеруне была показана высокая распространенность кишечных паразитов у ЛЖВ с количеством CD4 <200 кл/мл, не зависимо от проведения АРТ [11]. Анализ данных литературы свидетельствует, что спектр возбудителей кишечных паразитозов и их распространенность среди ЛЖВ варьирует в различных странах, зависит от факторов внешней среды, природных и социальных условий. Требуется углубленного изучения влияние степени иммуносупрессии, получение пациентами АРТ на распространенность кишечных паразитозов. В доступной литературе мы не нашли данных о таких работах, проведенных в европейском регионе.

Цель работы изучить распространенность кишечных паразитов у людей, живущих с ВИЧ, в зависимости от количества CD4 Т клеток, уровня вирусной нагрузки ВИЧ и проведения АРТ-терапии.

Материалы и методы. Проведено кросс-секционное исследование в отделениях ВИЧ-инфекции на базе клиники Института эпидемиологии и инфекционных болезней НАМН Украины и городской клинической больницы № 5 (г. Киев). В отделениях проводился мониторинг клинического состояния ЛЖВ, назначение и мониторинг проведения АРТ. В исследование были включены в том числе «наивные» пациенты, еще не получавшие АРТ. Исследование проводилось в период январь 2017 – июнь 2019 г., в нем участвовало 200 человек, 114 мужчин (57,0%) и 86 женщин (43,0%). Средний возраст пациентов составлял $40,68 \pm 0,62$ лет (интервал от 29 до 60 лет). Средний возраст мужчин ($40,68 \pm 0,63$) и женщин ($40,82 \pm 0,63$ года) не различался. Предполагаемый путь инфицирования ВИЧ у 61,5% пациентов был половой, у 38,5% – в результате инъекционного потребления наркотиков. У большинства пациентов (70,9%) установлена IV стадия ВИЧ-инфекции, III стадия – была у 19,4%, II – у 4,1%, I – у 5,6% ЛЖВ. У всех пациентов была определена дата начала АРТ (или ее отсутствие). Никто из пациентов не получал противопаразитарную терапию до начала исследования. Все пациенты были информированы о конфиденциальности их персональных данных.

Лабораторные исследования включали определение вирусной нагрузки (ВН) ВИЧ и количества CD4 Т клеток. Уровень ВН определяли по количеству РНК-копий ВИЧ-1 в 1 мл плазмы крови. Исследования проводили методом обратной транскрипции и полимеразной цепной реакции (ОТ-ПЦР) с использованием коммерческих тест-систем «Real Time HIV-1» (Abbott). Специфичность тест-системы составляет 99,5%. Аналитическая чувствительность: верхняя граница концентрации РНК ВИЧ-1 – 10 млн. копий/мл, нижняя граница эквивалентна 40 копиям/мл при исследовании 1 мл образца плазмы. Определение CD4 клеток проводили методом проточной цитометрии с использованием прямой иммунофлюоресценции клеток периферической крови на проточном цитометре FS 500 (Beckman Coulter, США) с помощью мультипараметрического анализа. Подсчет абсолютного количества CD4 клеток проводили с использованием технологии Flow-Count Fluorespheres.

Биоматериал (фекалии) пациенты собирали во флаконы с консервантом [12] руководствуясь специально разработанными памятками.

Для выявления кишечных паразитов в лаборатории использовали метод концентрации флотацией по Фюлеборну. Исследовали нативные и окрашенные раствором Люголя препараты. Для выявления ооцист криптоспоридий мазки фиксировали смесью Никифорова, высушивали и окрашивали по Циль-Нельсену. Микроскопию проводили под увеличением 10×10 – 10×100 . Статистическую обработку результатов и расчеты проводили с помощью унифицированных функций, предусмотренных программой Microsoft Office Excel.

Результаты исследования. Общая частота выявления кишечных паразитов у ЛЖВ обследованной группы составила 30,0% (60 из 200). В это число вошли также пациенты, у которых были выявлены не патогенные простейшие (*Entamoeba coli* и *Endolimax nana*) – 4 человека и 21 человек, у которых определялись единичные (до 5 в поле зрения) цисты *Blastocystis hominis*. Паразитарная инвазия (выявление патогенных кишечных паразитов или цист/ооцист условно патогенных кишечных паразитов в количестве более 5 в поле зрения) установлена у 35 пациентов (17,5%). У пациентов с паразитарной инвазией чаще всего выявляли *Cryptosporidium spp.* – у 21 человека (10,5%), *Bl. hominis* (более 5 цист в поле зрения) – у 10 пациентов (5,0%), *Ascaris lumbricoides* – у 3 (1,5%), *Giardia lamblia* – у 1 (0,5%).

По количеству CD4 Т клеток, выделяли пациентов с выраженной (<200 кл/мкл), умеренной (200–349 кл/мкл), средней (350–500 кл/мкл) и незначительной (>500 кл/мкл)

иммуносупрессией [13]. Среди пациентов, у которых были выявлены кишечные паразиты достоверно чаще ($p < 0,01$) встречались лица с выраженной иммуносупрессией. Влияние уровня иммуносупрессии на инвазированность ЛЖВ кишечными паразитами представлено на рисунке.

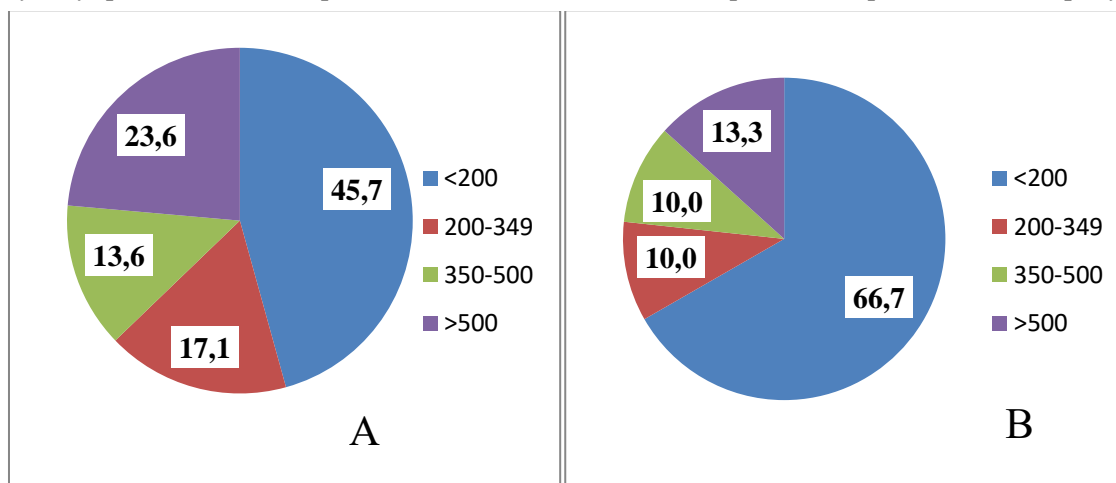


Рис. 1. Распределение ЛЖВ (в %) с различным уровнем CD4 клеток в зависимости от выявления у них кишечных паразитов. А – кишечные паразиты не выявлены. В – кишечные паразиты выявлены

Среднее количество CD4 клеток у пациентов с паразитарной инвазией составляло $214,09 \pm 38,9$ кл/мкл. В случае выявления у пациентов непатогенных простейших и единичных ооцист *Bl. hominis* среднее количество CD4 клеток составляло $195,52 \pm 54,75$ кл/мкл, что было достоверно ниже ($p < 0,05$), чем у пациентов с отсутствием кишечных паразитов ($329,19 \pm 28,43$).

Среди ЛЖВ с выявленными кишечными паразитами достоверно реже ($p < 0,01$) встречались пациенты с неопределяемым уровнем ВН ВИЧ (<40 копий/мл) – 35,0% (21 из 60), чем среди не инвазированных пациентов – 55,7% (78 из 140). Таким образом, выявление паразитарной инвазии коррелировало с активностью инфекционного процесса ВИЧ-инфекции.

Среди обследованных ЛЖВ не получали АРТ вообще («наивные пациенты») 84 человека, получали АРТ 116 пациентов, из них терапию до 6 месяцев получали 23 пациента. Среди пациентов, у которых были выявлены кишечные паразиты, АРТ более 6 месяцев получали 28,3%, в группе пациентов, у которых паразиты обнаружены не были – 54,3% ($p < 0,001$). «Наивные пациенты» среди ЛЖВ с выявленными кишечными паразитами составили 45,0% (27 из 60), среди не инвазированных – 35,7% (50 из 140), $p > 0,05$.

Сравнительная характеристика различных групп обследованных пациентов представлена в таблице.

Таблица 1. Сравнительная характеристика обследованных пациентов в зависимости от выявления кишечных паразитов

Параметры	Всего (200)		Не инвазированные (140)		Паразитарная инвазия (35)		Непатогенные простейшие или <i>Bl. hominis</i> меньше 5 в п/з (25)	
	n	ср.знач \pm m % \pm m	n	ср.знач \pm m % \pm m	n	ср.знач \pm m % \pm m	n	ср.знач \pm m % \pm m
Мужчины	114	57,0	85	60,7	20	57,1	11	44,0
Женщины	86	43,0	55	39,3	15	42,9	14	56,0
Средний возраст	40,68 \pm 0,62		40,74 \pm 0,77		40,17 \pm 1,41		41,84 \pm 1,45	
Среднее количество CD4 кл/мкл	287,35 \pm 22,20		329,19 \pm 28,43		214,09 \pm 38,9*		172,72 \pm 47,17*	
ВН <40 копий/мл	101	50,5 \pm 3,5	78	55,7 \pm 4,2	14	40,0 \pm 8,3	7	28,0 \pm 9,0*
Получают АРТ меньше 6 месяцев	107	53,5 \pm 3,5	64	45,7 \pm 4,2	23	65,7 \pm 8,0*	20	80,0 \pm 8,0*

* - разница достоверно отличается от показателей у не инвазированных пациентов

Обсуждение. Полученные результаты в целом подтверждают данные литературы о высокой распространенности кишечных паразитов у ВИЧ-положительных пациентов, которая колеблется в пределах 12,6-27% [14, 15, 16]. Наиболее часто у обследованных нами пациентов были выявлены *Cryptosporidium spp.* (10,5%), что также совпадает с результатами, приведенными в систематизированном обзоре, посвященном распространенности *Cryptosporidium*, *Microsporidia* и *Isospora* у ВИЧ-инфицированных лиц [6]. В то же время, по данным нашего исследования частота выявления у ЛЖВ *Giardia lamblia* (0,5%) и гельминтов (1,5%) была невысокой. По нашим данным, инвазированность ЛЖВ *Bl. hominis* была высокой. Если учитывать пациентов, у которых были выявлены единичные цисты *Bl. hominis*, распространенность этого условного патогенного простейшего составила 15,5%. Таким образом, установленный нами спектр кишечных паразитов отличался от такового, например, в Эфиопии, где доминировали *Ent. histolytica/dispar* (18,6%) и *G. lamblia* (2,1%), а общая инвазированность ВИЧ-положительных лиц составила 26,4% [17]. Наши данные больше соответствовали результатам, полученным турецкими исследователями [18] при обследовании 65 ВИЧ-положительных пациентов. *Cryptosporidium spp.* были выявлены у 21,5%, *Blastocystis spp.* – у 10,8%. Важно также отметить, что спектр кишечных паразитов, выявляемых у ЛЖВ, может не соответствовать значимости той либо другой инвазии для населения региона в целом. Так, нами были получены данные о невысокой распространенности *Cryptosporidium spp.* у обследованных представителей взрослого населения (1,1%), в то же время гельминты были выявлены чаще (5,2%), чем у ЛЖВ и представлены не только *Ascaris lumbricoides*, но и *Enterobius vermicularis* и *Opisthorchis felineus* [19].

В нашем исследовании показана достоверная связь между количеством CD4 клеток и наличием кишечных паразитов у ВИЧ-положительных пациентов. Следует отметить, что в целом в обследованной нами группе ЛЖВ уровень CD4 был меньше 350 кл/мл, что связано с преобладанием среди пациентов лиц с IV стадией ВИЧ-инфекции. При этом среднее количество CD4 Т клеток было достоверно ниже в группе пациентов, инвазированных кишечными паразитами. Мы получили данные, указывающие на то, что выявление даже единичных ооцист *Bl. hominis* у ВИЧ-положительных лиц может указывать на снижение количества CD4 клеток. Можно предположить, что подходы, которые используются для иммунокомпетентных лиц, в отношении количества выделенных условно патогенных простейших, в частности *Bl. Hominis* (более 5 в поле зрения), не могут быть использованы для ВИЧ-инфицированных пациентов – выявление даже единичных условно патогенных паразитов у ЛЖВ при наличии клинических проявлений может служить показанием для проведения противопаразитарной терапии. Выявление кишечных паразитов у ЛЖВ также коррелировало с вирусной нагрузкой ВИЧ. Среди лиц с кишечными паразитами достоверно реже встречались пациенты с неопределяемым уровнем копий РНК ВИЧ (<40 копий/мл). Таким образом, выявление у ЛЖВ кишечных простейших, даже условно патогенных, может быть использовано в качестве маркера иммунной супрессии, репликативной активности ВИЧ и, соответственно, коррелировать со стадией ВИЧ-инфекции.

Полученные нами данные согласуются с результатами других исследований о положительном влиянии АРТ на инвазированность кишечными паразитами ВИЧ-положительных пациентов. Нами не получены достоверные данные о большей распространенности кишечных паразитов у «наивных» пациентов в сравнении с ЛЖВ, которые получают АРТ меньше 6 месяцев. В то же время инвазированность пациентов, которые получали АРТ больше 6 месяцев, была достоверно ниже (21,9%), чем пациентов, которые получали АРТ меньше 6 мес. или не получали вообще – 40,2%, $p < 0,001$. Таким образом положительное влияние АРТ на оппортунистические инфекции и инвазии может быть заметно не ранее, чем через 6 месяцев, после начала АРТ [20, 21].

Заключение. Получены данные о высокой распространенности (30%) кишечных паразитов у ЛЖВ, обследованных в Киеве (Украина). Инвазия *Cryptosporidium spp.* составила 10,5%, *Ascaris lumbricoides* – 1,5%, *Giardia lamblia* – 0,5%. Условно патогенные простейшие *Bl. hominis* выявлены у 15,5% обследованных пациентов. В исследовании показано, что даже обнаружение единичных ооцист *Bl. hominis* у ЛЖВ может быть косвенным показателем прогрессирования ВИЧ-инфекции, что подтверждает важность паразитологического обследования данной категории пациентов. Основными факторами, связанными с распространенностью кишечных паразитов, были: выраженная иммуносупрессия (<200 CD4 кл/мл), высокий уровень ВН ВИЧ, не получение пациентами АРТ или получение терапии меньше 6 месяцев.

ЛИТЕРАТУРА

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PEDAGOGY

КУЛЬТУРОСЕМІОТИЧНИЙ, МЕДІАТЕХНОЛОГІЧНИЙ, КОМУНІКАТИВНИЙ ПІДХОДИ У ДОСЛІДЖЕННІ ПОНЯТТЯ «ІНТЕРМЕДІАЛЬНІСТЬ»

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ABSTRACT

Intermediality has been described as phenomenon of interartistic interaction and actual scientific approach of interdisciplinary studies. Different approaches of Ukrainian and foreign researchers for defining this concept have been analyzed. It has been generalized that intermediality is interpreted as interaction of semiotic codes of different arts in the multimedia space of culture. It has been emphasized that the basis of intermediality is inter-semiotic interaction, comparative analysis of texts (digital non-digital), system of communicative competence and personal aesthetic experience. The main approaches to the classification of interartistic relations have been analyzed. Taking into account the polysemy of the notion of «media» (as a carrier of information, a sign system, technical means of communication, a way of communication) the idea has been grounded on the fact that today the concept of «intermediality» should be considered from three sides: cultural-semiotic, media-technological and communicative. In view of this, three approaches to the understanding of intermediality have been outlined: cultural-semiotic, media-technological, communicative.

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Вступ. Наприкінці ХХ ст. разом із суміжним поняттям «інтертекстуальність» до теоретичного обігу гуманітарних наук увійшло поняття «інтермедіальність» на ознаку міжмистецької взаємодії як предмета художнього дискурсу. Точкою відліку історії інтермедіальності як самостійного наукового напрямку, зазначає Н. Мочернюк [8, с. 43], можна вважати 50 – 60-ті роки ХХ століття. Дослідниця пов'язує відокремлення цієї галузі від компаративістичної науки з виходом монографії С. Шера про німецьку літературу (її зв'язок із музикою) у 1968 році. Тоді як Е. Циховська вказує на 1983 рік, посилаючись на «Routledge Encyclopedia of Narrative Theory», де називається ім'я німецького дослідника А. Ханзен-Льове, який зафіксував кореляції між літературою та візуальними мистецтвами (й частково музикою). Авторка стверджує, що саме в А. Ханзена-Льове інтермедіальність вперше була презентована як дослідницька парадигма [12, с. 51], хоча тенденція митців виходити за межі традиційних видів мистецтв була помітна ще раніше (Д. Хігінс, С.-Т. Кольрідж та ін.). Наприкінці ХХ ст. ця теорія набула особливої популярності, пов'язану з розвитком кіномистецтва та ЗМІ, які транслювали художню інформацію різними каналами зв'язку. Розвиток цифрових технологій уможливив подачу візуальної «картинки», в якій переплелися різні мистецькі коди, створюючи ефект кольорової

віртуальної гри. Інтермедіальна індустрія запропонувала оригінальну візуальну поезію та музику, інтермедіальну фотографію (додалися можливості фотошопу), анімаційні та відеофільми з надзвичайними стереоефектами, відеокліпи, світломузику, телевізійне мистецтво (поєднане з філософією світла, кольору і пластики), комп'ютерні ігри та мистецтво реклами, мультимедіальні перформанси, імерсивні виставки тощо. Проте й досі ця теорія не зайняла належного місця в педагогічно-мистецькій практиці, адже вивчення та аналіз мистецьких артефактів (великий пласт у змісті освіти!) без урахування механізмів їх взаємодії, без вживання відповідної термінології видається неповним і некоректним. Нинішню систему освіти неможливо уявити без глобальної бази мультимедійних технологій, проте, на жаль, майже зовсім не береться до уваги аналіз механізмів творення і впливів медіатекстів, інтермедіальна природа яких очевидна. Заявки про формування критичного мислення, наприклад, у роботі з медіатекстами залишаються голослівними, позаяк, зазвичай, не враховуються медіальні фактори впливу на сприйняття інформації, які часто професійними технологами зашифровані між рядками.

На особливу увагу в теорії інтермедіальності заслуговує позиція автора як творця власної комунікативної стратегії, адже влітаючи в художній простір власного тексту зразки інших семіотичних систем (музичні, живописні, архітектурні тощо) автор створює особливе інформаційно-комунікативне семіотичне середовище, у якому інший комунікант, активізуючи свої інтелектуальні, асоціативні, емоційні, прагматичні ресурси, здатний «влонити» намір митця, зрозуміти його естетичну програму, змінюючи власну свідомість. Такий діалог, наприклад, між автором і читачем в парадигмі вербально-музичної комунікації, як слушно зазначає О. Маленко [7], стає спільною творчістю, пошуком найглибших пластів проникнення авторського задуму у свідомість реципієнта.

Мета статті: на основі аналізу різних авторських інтерпретацій поняття «інтермедіальність» і класифікацій міжсеміотичних взаємозв'язків обґрунтувати культурносеміотичний, медіатехнологічний, комунікативний підходи до розуміння цього феномена в гуманітарних науках.

Результати дослідження. Інтермедіальність як актуальне мистецьке явище відповідає основним тенденціям сучасної гуманітаристики, адже тяжіє до міждисциплінарності, виявляє високий інтерес до проблем медіа на тлі активного розвитку цифрової культури, відповідає сучасним культурним реаліям у пошуку нових методологічних підходів. На думку вчених, інтермедіальний підхід дозволяє системно відтворювати складні процеси міжсеміотичних кореляцій, позаяк концентрує увагу не лише на учасниках комунікації (чи то мистецтво, чи наука, чи культура в цілому), але й на механізмах їх взаємодії та результатах такої взаємодії [11, с. 38].

У теорії інтермедіальності, яка сформувалася в контексті компаративістики, виокремилися різні підходи до розкриття сутності цього феномена, що зумовило появу численних класифікацій, в основі яких – специфічні форми міжмистецьких відношень. Так, А. Ханзен-Льове виокремлює три типи інтермедіальності. Перший пов'язаний із моделюванням фактури іншого виду мистецтва, наприклад: візуальних форм у поезії, таких, як акровірш, паліндром тощо. Другий виявляється в реалізації формотвірних принципів музичного, живописного чи архітектурного твору в літературному. Третій ґрунтується на інкорпоруванні мотивів, образів, сюжетів музики, живопису чи інших видів мистецтва в художній текст [4, с. 25]. Відомий теоретик міжсеміотичних кореляцій В. Вольф [18], доповнивши класифікацію С. Шера [17] – дослідника в галузі компаративістики (зв'язку музики та літератури: літератури в музиці (програмна музика), музики та літератури (вокальна музика), музики в літературі (музичність літератури)) – згрупував міжмистецькі зв'язки за *екстракомпозиційним* та *інтракомпозиційним* принципом, надаючи останньому більшої ваги і широкого значення. Отже, екстракомпозиційна інтермедіальність, на думку науковця, охоплює трансмедіальність і транспозицію, тоді як інтракомпозиційна – інтермедіальні посилення (використання однієї семіотичної системи) та плуральну інтермедіальність (використання понад одного символу, які належать до кількох семіотичних систем). Отже, дослідник доводить існування взаємодії семіотичних систем як всередині одного твору, так і поза його межами.

Для глибшого розуміння вищезазначеного феномена послуговуємося полемікою В. Вольфа та німецької вченої І. Раєвські [16], котра виокремлює три види інтермедіальності: 1) *медійні переміщення* (екранізація, белетризація); 2) *медіакомбінації*, або нормативна інтермедіальність, сутність якої полягає у тому, що один і той самий сюжет розробляється різними медіа й виробляється нормативність першоджерела; 3) *інтермедіальні посилення* (втілення або імітація певних прийомів, технік інших мистецтв). Аналіз підходів В. Вольфа та І. Раєвські до різного роду

кореляцій дозволяє зробити висновок, що обидва вчені виявляють подібні механізми запозичень і констатують факт внутрішніх і зовнішніх зв'язків семіотичних систем. Наприклад, такі відношення виникають між різними медіа в межах театральної вистави, або пісні, де поетичний текст виявляється в контексті музичного твору; у взаємодоповненні піктуральних і вербальних чинників у пластичних формах (емблемах, плакатах); літературному відтворенні малярських і музичних тем, кінематографічній адаптації наративно-літературних творів тощо [1, с. 250].

Чотири варіанти дослідження окресленого явища пропонує німецький дослідник Є. Шрьотер (Schröter), виявляючи відповідно чотири типи інтермедіальності: *синтетичну* (виникнення певного «інтермедіума», в якому неможливо відділити одне мистецтво від іншого, в якому відбувається одночасна репрезентація різних медіаформ, наприклад, візуальна поезія); *трансмедіальну* (розглядає передачу одного і того ж наративу різними видами мистецтв (медіа), наприклад, тема, сюжет, композиція, мотив, циклічність, ритмічність тощо можуть виражатися за допомогою різних медіа); *трансформаційну* (репрезентація одного медіа іншим, перекодування інформації з однієї знакової системи в іншу, наприклад, у випадку екранізації літературного твору); *онтологічну* (виявлення спільних і відмінних рис різних медіа у випадку, коли один вид мистецтва містить елементи і можливості іншого, наприклад, літературність музики чи музичність літератури, театральність прози тощо). Беремо до уваги зауваження М. Ільчука стосовно того, що «класифікація Єнса Шрьотера містить радше підходи до дослідження інтермедіальності, аніж класифікацію інтермедіальних відносин. Проте на основі цих підходів часто визначають однойменні типи інтермедіальних відношень, які стають предметом численних наукових пошуків» [3, с. 88].

Популярність терміна «інтермедіальність» у літературознавчих (компаративних), мистецтвознавчих, культурологічних дослідженнях зумовлений сучасними потребами науки в обґрунтуванні цілісності знань, що передбачає подолання міждисциплінарних меж, а також потребами особистості, яка сьогодні проживає і розвивається у тісному контакті зі світом медіа. Тому часто зустрічаємо тотожні терміни, такі як: інтерсеміотичність, інтердискурсивність, інтермодальність, інтерхудожність, інтермедійність, мультимедійність тощо. Всі ці поняття є суміжними (не синонімічними) та зумовлюють можливість інтермедіальних зв'язків. Підсумовуючи різні підходи до пояснення інтермедіальності, можна зробити висновок, що, не зважаючи на різне потрактування цього мистецького феномена, його тлумачення в загальному розумінні завжди буде стосуватися проблеми цілісного інтегративно-семіотичного середовища. Основні концепти можна систематизувати у таблиці (табл. 1).

Таблиця 1. Інтермедіальність: дефініції поняття

Співпраця гетерогенних художніх форм у рамках одного інтегрального медіума (театр, опера, кінофільм, перформанс тощо), мультимедійна презентація.	<i>Hansen-Löve A.</i> Intermedialität und Intertextualität: Probleme der Korrelation von Wort und Bildkunst – am Beispiel der russischen Moderne// Wiener Slawistischer Almanach. – Wien, 1983. – Sbd.11. s. 291-292.
Інтеграція естетичних концептів окремих медіа в новий медійний контекст.	<i>Muller Jurgen E.</i> Intermedialität: Formen moderner kultureller Kommunikation. – Munster: Nodus Publicationen, 1996. – s.335.
Особливий тип взаємозв'язків у художньому творі, побудованому на взаємодії художніх кодів різних мистецтв (у широкому значенні – це цілісний художній простір в культурі)	<i>Ильин И. П.</i> Некоторые концепции искусства постмодерна в современных зарубежных исследованиях. – М., 1998. – с. 8.
Створення цілісного поліхудожнього простору в системі культури або створення художньої метамови культури (в широкому значенні). Особливий тип внутрішньотекстових взаємозв'язків в художньому творі, зумовлений взаємодією мов різних видів мистецтва (у вузькому значенні). Наявність в художньому творі таких образних структур, в яких міститься інформація про інший вид мистецтва.	<i>Тишуніна Н.</i> Інтермедіальність: к определению границ понятия // Литература в системе искусств: методология междисциплинарных исследований: Тезисы I Международной конференции 23 – 25 марта 2000 г., СПб, 2000. – с.17.
Внутрішньотекстова взаємодія у літературному творі семіотичних кодів різних мистецтв; взаємодія семіотичних кодів різних мистецтв у мультимедійному просторі культури.	<i>Будний В., Ільницький М.</i> Порівняльне літературознавство: Підручник. К.: Вид. дім «Києво-Могилянська академія». 2008. – с. 297.

Продовження таблиці 1.

Гетеромедійні реляції між різними семіотичними комплексами, або між різними частинами семіотичного комплексу	<i>Wolf. W. Intermediality // Routledge Encyclopedia of narrative theory. – New York: Routledge, 2010. – P. 252.</i>
<i>Тимашков А. Ю. Интермедальность как авторская стратегия в европейской художественной культуре XIX – XX вв. [автореф. дис. ... канд. искусствоведения: 17.00.09 – теория и история искусства]. – СПб., 2012. – 20 с.</i>	<i>Тимашков А. Ю. Интермедальность как авторская стратегия в европейской художественной культуре XIX – XX вв. [автореф. дис. ... канд. искусствоведения: 17.00.09 – теория и история искусства]. – СПб., 2012. – 20 с.</i>
Акти взаємодії літератури та інших мистецтв з акцентом на знаково-смісловій відповідності зіставлень.	<i>Бовсунівська Т. В. Екфразис & Интермедальність // Літературознавчі студії. – 2013. – Вип. 39 (1) – С. 113.</i>
Онтологічна характеристика сучасної мультимедіальної культури в її зв'язку з освітою і суспільством, занурених в цифровий простір.	<i>Хаминова А. А., Зильберман Н. Н. Теория интермедальности в контексте современной гуманитарной науки // Вестник Томского государственн. Ун-та, 2014. – № 389. – С. 43.</i>
Гетеромедійні реляції, схематизовані формулою: Я + безліч інших (інтертекстуальність: Я + безліч таких, як Я).	<i>Циховська Е. Теоретичні дилеми поняття інтермедальності // Слово і Час: науково-теоретичний журнал. – № 11 (647), 2014. – С.58.</i>
Формальна взаємодія різних видів мистецтва та будь-яких інших дискурсів. Интермедальність не тільки властивість тексту, означена онтологією семіотичних практик, а й індивідуальне устремління автора художнього твору, естетична авторська стратегія, мета якої виявити структуру й художньо формалізувати взаємодії медіа.	<i>Сиваченко Г. Интермедіальна парадигма роману Володимира Винниченка «Сонячна машина» // Слово і час. – №2. – 2017. – с. 3.</i>
Взаємодія різних медіа. Интермедіальні конфігурації порушують важливе питання щодо подолання міжмедіального «проміжного».	<i>Маценка С. Метамистецтво: словник досвіду термінотворення на межі літератури й музики / графіка Олега Денисюка. – Львів: Априорі, 2017. – С.60.</i>
Особлива форма інтертекстуальності, за якої художнє багатоголосся визначається наявністю таких міжтекстових зв'язків, коли «текстом» стає інший вид мистецтва.	<i>Мочернюк Н. Поза контекстом: Интермедіальні стратегії літературної творчості українських письменників-художників міжвоєннє: монографія. - Львів: Вид-во Львівської політехніки, 2018. - с.46.</i>
Активна взаємодія (але не змішування) між різними медіа, специфічна форма їх існування в сучасних технічних, соціокультурних і економічних умовах	<i>Джумайло О. А. Понятие интермедальности и его эволюция в современном научном знании // Верхневолжский филологический вестник. – № 4(15), 2018. – с. 58-62. с. 61.</i>

Джерело: розроблено автором дослідження

Аналіз широкого кола досліджень з проблем термінології на позначення явища міжмистецької взаємодії засвідчує скрупульозний пошук українських і зарубіжних учених щодо найвдалішого терміна з урахуванням багатозначності слова медіа, а також демонструє неабияку зацікавленість у міждисциплінарних студіях. Так, І. Жодані зазначає, що в контексті взаємодії мистецтв на термінотворення найбільшим чином вплинули два фактори: розвиток семіотики й теорії комунікації та винайдення цифрових технологій, що зумовило активне впровадження терміна «медіа» на позначення засобу зберігання та передавання інформації [2]. У зв'язку з цим окреслюється термінологічне поле медіакультури, в якому увиразнені такі сучасні поняття, як «медіа» й «мультимедійність». В. Будний і М. Ільницький трактують їх так: «*Media* – це не лише засоби масової комунікації, а й специфічні знакові системи різних мистецтв, які є каналами передачі образної інформації. Мультимедійність означає узгоджене поєднання в єдиному ансамблі двох чи більше медіа, які одночасно сприймаються різними органами відчуттів» [1, с. 292]. Відтак інтермедіальність є результатом такого синхронного сприйняття, наслідком процесу смислотворення, підсиленій ефектом об'ємних вражень.

Теорія інтермедіальності як специфічна методологія охоплює три основні значення медіа: знакова система (код культури), засоби масової інформації (комунікаційні технології), комунікативний канал (спосіб отримання і передачі інформації) [8, с. 43]. У зв'язку з цим для розкриття сутності інтермедіальності як особливого типу відношень, що виникають між медіа варто враховувати культурносеміотичний, медіатехнологічний, комунікативний підходи. Особливості кожного окреслено в таблиці (Табл.2).

Таблиця 2. Підходи до розуміння інтермедіальності

Підхід	Культурносеміотичний	Медіатехнологічний	Комунікативний
Представники	С. Колрідж, Д. Хігінс, О. Ханзен-Льове, Ю. Мюллер, В. Вольф, Ю. Лотман, Р. Якобсон, І. Льїн, Н. Тішуніна, В. Будний, М. Ільницькй, Т. Бовсунівська, В. Просалова, Е. Циховська, І. Жодані, Н. Мочернюк	М. Маклюен, Д. Мак-Квейл, Г. Лассуелл, К. Шеннон, Н. Вінер, У. Вівер, К. Йенсен, Р. Дебре, О. Джумайло, Є. Морозов, Ж. Мюррей, Я. Нільсон, Н. Негропonte, Ш. Текл, Н. Харбіссон	К. Йенсен, Н. Луман, О. Тімашков, Е. Шестакова, А. Хамінова, Н. Зільберман, Г. Сиваченко, Г. Онкович
Розуміння медіа	знакова система – носій інформації	матеріальний носій (технічні засоби масової комунікації)	комунікативний канал, спосіб передачі інформації
Функціонування термінів	Інтермедіальність (взаємодія знакових систем)	Інтермедійність (взаємодія різних медіа)	інтермедіальність, інтермедійність
Базова теорія	теорія інтертекстуальності, теорія інтермедіальності	теорія масової комунікації	теорія комунікацій (моделі комунікації)
Науковий контекст	мовознавство, літературознавство, мистецтвознавство, семіотика	математика, інформатика, кібернетика, програмування	дидактика (медіадидактика), психологія, соціологія, комунікативістика
Мета (наукова)	дослідження взаємодії семіотичних кодів різних знакових систем, взаємодії «людина – знакова система»	дослідження взаємодії системи «людина – машина», функціонування інформаційних технологій у соціумі	дослідження комунікативної взаємодії учасників спілкування, аналіз системи «людина – людина»
Мета (освітня)	формування поліхудожньої свідомості сучасної людини культури	формування медіаграмотності людини інформаційного суспільства	формування комунікативної компетентності педагога, студента, учня
Середовище	семіотичне (семіосфера)	аналогове, цифрове, онлайн-простір (медіасфера)	інформаційно-комунікативне (інфосфера)
Об'єктивація (результат)	твори мистецтва, медіатексти (художні)	Мультимедіа презентації, медіатексти (нехудожні), інформаційні технології, освітні програми	комунікативні стратегії і технології, освітні технології, програми

Джерело: розроблено автором дослідження

Для нашого дослідження важливим є особливе значення інтермедіальності, увиразнене А. Хаміною та Н. Зільберман, а саме – *середовище*, в просторі якого виробляються, естетизуються і транслуються культурні коди. З огляду на це, вчені трактують інтермедіальність як онтологічну властивість сучасної мультимодальної культури у її зв'язку з освітою та суспільством, зануреним у цифровий простір [11, с. 39, 43].

Безперечно, ідеї імплікації («холодні» та «гарячі» медіа) та гібридизації (взаємодії медіа) М. Маклюена, його концепція розширення комунікативних можливостей людини, пов'язана з технічним цивілізаційним прогресом, мали вагомий вплив на становлення й розвиток теорії інтермедіальності, що надало широкі можливості для неї адаптуватися в сучасному медіасередовищі, взявши до уваги тісну взаємодію людини і медіа – трансляторів культурних кодів (медіакодів), які детермінуються відповідною традицією та набувають ознак таксономічної матриці. З метою ідентифікації основних характеристик об'єкта, що є найсуттєвішими і необхідними для його легкого запам'ятовування та відтворення в комунікації, створювалися різні системи кодування медіатекстів, запропоновані теоретиками в рамках семіотичного аналізу (Ю. Крістева, Р. Барт, У. Еко, Дж. Фіск, Д. Чандлер та ін.). Найбільш повною, на нашу думку, є класифікація медійних кодів

Д. Чандлера [14], який виокремлює *соціальні* – вербальні (слова в мовному потоці), *тілесні* (зовнішність, жести, погляд, поза, положення тіла людини в просторі), *товарні* (одяг, машини, аксесуари тощо), *поведінкові* та *регулятивні*; *текстуальні* – естетичні (коди реалізму, авангарду, романтизму тощо), *жанрові, теоретичні і стилістичні* (конфлікт, композиція), *коди каналу передачі* (прямий ефір, монтаж); *інтерпретативні* – ідеологічні (гендерні, класові тощо), *коди сприйняття* (просторова перспектива тощо), якими кодуються й декоднуються медіатексти [9, с. 197 – 198]. Підтримуємо думку українських науковців В. Будного та М. Ільницького, що тенденції взаємодії та взаємовідповідності мистецтв є собливо промовистими на стильовому рівні, адже, наприклад, стилі бароко чи модерну (як стилістичні коди), маючи тотальний характер, охопили не лише різні мистецтва (музику, літературу, архітектуру, живопис), а й щоденний побут (інтер'єри, екстер'єри, мода тощо), світовідчуття і мислення сучасників. Міжмистецькі взаємодії яскраво виражені в літературі бароко, авангардизмі, постмодернізмі, тому ці стилі потребують міждисциплінарного дослідження. Це доводить, як стверджують учені, що стиль – категорія трансмедійна і кроскультурна [1, с. 297]. На жанровому рівні вирізняються, наприклад, коди музики (пісня, роман, етюд, ноктюрн, симфонія, поліфонія тощо), коди образотворчого мистецтва (етюд, натюрморт, портрет тощо), коди кіно (кіноповість, кіноновела, кіносценарій тощо).

Зважаючи на нагальну потребу інтеграції та актуалізації сучасного знання про світ, долаючи монокультурну обмеженість, дослідження широкого спектра педагогічних явищ в умовах нелінійного розширення інфопростору відбувається шляхом об'єднання методологічного інструментарію різних наукових галузей. Поняття «міждисциплінарність», «інтердисциплінарність», «трансдисциплінарність» з'являються як доказ руйнування меж між усталеними академічними дисциплінами та їх методологічними засадами. Показовим у цьому аспекті є термінологічний діапазон поняття інтермедіальності, який охоплює наступні дефініції: інтермедіальність як спосіб організації художнього матеріалу (О. Бровко), парадигма мислення (Г. Сиваченко), інтермедіальний коловорот (О. Дубініна), метамистецтво (С. Маценка), методологія аналізу художньої культури, особлива форма діалогу культу (Н. Тішуніна), художньо-світоглядна модель естетичного смислу (І. Мегела), дослідницький підхід (Ю. Геркман), світовідчуття сучасної людини (В. Просалова), логіка Мережі (М. Пунці) тощо [5, с. 130]. Н. Коробкова слушно зазначає, що у випадку, коли йдеться про формування естетично й інтелектуально розвиненої свідомості особистості, інтермедіальний аспект комунікації повинен займати домінуючу позицію, адже «синтезуючи у художньому творі коди різних мистецтв, митці створюють конкретно-чуттєвий простір поетичного тексту, в якому активуються акустичні, візуальні, вербальні, дотикові рецептори сприймання художнього образу. Інтермедіальність посилює інтелектуальний потенціал мовного знака й провокує асоціативно-творчу рефлексію читача, спрямовану на декодування семантично ускладнених, синестезичних образів» [4, с. 26]. Варто лише доповнити, що вищесказане може стосуватися не лише вербального знака, а й невербального також, адже феномен художності функціонує у будь-якому семіотичному просторі.

Сьогодні потужний потенціал інтермедіальності розкривається разом зі стрімким розвитком науки, зокрема кібернетики, завдяки інтенсивному поширенню механізмів технологізації мистецтв, у вир якого втягнуті не лише семіотичні системи, але й люди і машини. Яскравим прикладом такого розширення є феномен Ніла Харбіссона – унікального явища світового масштабу, першої людини-кіборга, офіційно визнаного паспортним реєстром Великобританії. Художник і музикант з діагнозом «ахромато́пія» (неможливість розрізняти кольори) веде активну творчу діяльність зі вживленням у власний мозок пристроєм (на кшталт відеокамери) Eyeborg, який перекодує світлові хвилі в звуки, що дозволяє йому розрізняти кольори. Ніл самостійно розширив свої можливості зі сприйняття кольору шляхом остеointegraції (вживлення пристрою в кістку черепа) спеціальної антени, враховуючи високу провідність кістки, перетворюючи свій череп в підсилювач, а голову в резонатор. Вживлений у голову Харбіссона механізм дозволяє йому чути і відчувати кольори (інформація про колір перекодується у вібрацію і резонує мелодією в голові). Так, бірюзовий колір відповідає ноті «до», фіолетовий – це «ре», рожевий – «мі», червоний – «фа», жовтий – «соль», зелений – «ля», блакитний – «сі» [13]. А Хамінова на прикладі феномена людини-кіборга обґрунтовує еволюцію теорії інтермедіальності від метафори до технології. Науковець констатує: «технологія перекладу кольору в звукову систему, запропонована Харбіссоном, відповідає принципу інтермедіальної взаємодії мистецтв як переклад мови однієї семіотичної системи на мову іншої. Переклад в теорії інтермедіальності розуміється не буквально, а як метафора, що означає процес інтерпретації, в межах якої може бути численна кількість текстів. Проте у випадку Харбіссона при збереженні принципу міжсеміотичного перекладу було знайдено технічну можливість зрощення двох мов різного медіального жанру – засобом світлових хвиль. Отже, технічно реалізована ідея

інтермедіальності відкрила перед людиною нові можливості сприйняття реальності, демонструючи механізм утворення візуального звуку [10, с. 83-84].

Не виникає сумнівів у тому, що педагогічна наука, зокрема медіадидактика, мистецька педагогіка, повинна активно долучитися до інтермедіального дискурсу і розробити власне бачення інтермедіальності як актуального методу художнього пізнання, а інтермедіальну технологію як інноваційний спосіб організації навчальної діяльності в закладах освіти.

Висновки. 1. Інтермедіальність – феномен міжмистецької взаємодії, який наприкінці ХХ ст. розвинувся як самостійний науковий напрям з теорії інтертекстуальності – означає взаємодію різних семіотичних структур у мультимедійному просторі культури.

2. Специфічні форми міжсеміотичних відношень лягли в основу численної кількості інтерпретацій та класифікацій інтермедіальності, розробленими українськими і зарубіжними вченими, з-поміж яких вирізняються як базові класифікації В. Вольфа, І. Раєвські, Є. Шрьотера.

3. Беручи до уваги три основні значення медіа (знакова система, засіб масової інформації, комунікативний канал) в сучасній науці окреслилися три підходи до розуміння поняття інтермедіальності: культурносеміотичний, медіатехнологічний, комунікативний. Перший підхід пов'язаний із дослідженням взаємодії в системі «людина – знакова система», другий – «людина – машина», третій – «людина – людина».

4. Враховуючи потреби сучасної науки в обґрунтуванні цілісності знань і потреби особистості (яка проживає і розвивається в медіасередовищі) в розумінні цілісної картини світу, вважаємо інтермедіальну теорію засадничою у формуванні фахової, зокрема комунікативної компетентності майбутнього вчителя мистецтва.

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PHILOSOPHY

**ERICH FROMM'S "HUMANISTIC RADICALISM".
HISTORICAL OCCURRENCE AND POLITICAL
ACTIVITY**

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ABSTRACT

The purpose of this article was to study the creative heritage of Erich Fromm and the formation of «Humanistic Radicalism». The study was aimed at defining the historical context for the theoretical formation of «Humanistic Radicalism» within the framework of Fromm's «Social Psychoanalysis» and the practical implementation of this concept in the political activities of this personality. Four periods of the introduction of the ideas of «Humanistic Radicalism» by E. Fromm through his political activities were identified. It was found out that the humanistic orientation requires the continuation both in research activities of a person and in everyday socio-cultural life in general, while maintaining dialogical relations with the world.

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Introduction. Increasingly, scientists point to the deadlock situation of human civilization, they say that «man and history have come to an end» [3]. In this regard, the appeal to the creative heritage of thinkers, rethinking the usual ways of dealing with reality, deserves special attention. Among them is Erich Fromm, well known to the scientific community and whose ideas served as a catalyst for philosophical disputes and discussions that raised a very large stratum of socio-anthropological and ethical issues. Over the years, interest in the achievements of Fromm has increased immeasurably, because in his system of «humanistic radicalism» he largely anticipated the formulation and partial solution of the actual problems of our time.

Research results. Erich Fromm is the founder of many research programs studying global problems in the complex, interdisciplinary cognition of man. His warning is a tragic statement: «A man has such means of destruction, before which love of life may be powerless» [5, p. 51].

In the last two or three decades, almost all of the fundamental works of Erich Fromm, each of which contains a world-view core aimed at tomorrow, revealing «new compounds the molecule of the Human race» (E. Fromm) as a whole, have been published. «I believe», writes E. Fromm, «that every human being represents all humanity. We differ in reason, health, and ability. However, we are all alone. We all are saints and sinners, adults and children, but none of them exceeds the other and does not judge him. All of us were inscrutable with the Buddha, crucified us all together with Christ, but we killed and robbed us all along with Genghis Khan, Stalin, and Hitler» [5, p. 37]. Describing the «human situation», E. Fromm, who knows the secrets of social change and the psychological device of man, designs this situation in the coming times and prescribes the so-called today's day in a new cycle

of human existence. Through the heart of E. Fromm, let's allow for a comparison, the fracture that split exactly in the historical moment of the XX century reality makes itself known in the XXI century.

Increasing the dehumanization of a person raises the question of the ecology of his consciousness «at the forefront». In other words, human problems, being one of the main problems for many millennia of human history, appeared in the XXI century as a complex scientific problem, which requires not only the theoretical reflection but also practical solution.

The line of Erich Fromm is «humanistic radicalism» as the «alpha» and «omega» of being. With the implementation of the principle of «humanistic radicalism,» as well as the search for ways of actualizing human in a person in the process of its life–creation, with the identification of mechanisms for updating the creative potential of the individual, we associate the possibility of adequate self–determination of man in the world and the emergence of a crisis state, which was a modern civilization. By E. Fromm, the concept of «humanistic radicalism» has the most powerful heuristic potential, first of all, in the study of the problem of society and its power structures.

According to E. Fromm, the violence that gives rise to fear is the factor that pushes a person to accept fiction and illusions for the truth. It is the atmosphere of violence that deforms the mind and the person's feelings. «There is an acute political need for such people who, being experts in their business and interested in politics, could freely express what they know and think», said once in an interview with Schulz Erich Fromm – personality in full political, but with the characteristic feature of independence and freedom [5, p. 52].

The increased interest of E. Fromm in public and political issues, which became a prerequisite for the creation of an image of a new society, has appeared since the early '50s. Certain role in this, undoubtedly, has played Fromm's life in Mexico, where he moved in 1949 and began to work on the creation of a psychoanalytic institute. All his time studies the phenomenon of capitalism in the past and the New Age, as well as the study of the history of socialist social projects. In 1955, E. Fromm publishes the book «Healthy Society», which creates the image of an inalienable society with a healthy physical structure. Fundamentally new is the emphasis of Fromm on the socio–psychological approach to the «Social Character», which is a kind of key to a «Healthy Society». In 1960, he joined the Socialist Party of the United States, forming a new program focused on the humanism of Marx, which was rejected due to the resistance of the party bureaucracy. «With all my optimism, I could no longer remain in the ranks of the American Socialist Party», remembers E. Fromm [5, p. 59]. He leaves the party and looks for other forms of political activity [6, p. 110].

The first form of the political activity of Fromm: the compilation and distribution of texts with a statement of the position on topical political issues. In particular, the «Bulletin of the correspondent committee» published open letters discussing foreign policy issues related to the Soviet Union, China, the Cuban crisis, and the development of Israel in support of the movement to protect peace on Earth.

The second form of political activity is the organization and participation of political movements. For example, in the period from 1957–1968, E. Fromm gave much time, forces and inspiration, money to protect the world, demonstrating the initiative of disarmament. In 1957, he participated in the founding of the «National Center for Health Policy».

Speaking against nuclear weapons, against hostilities, Erich Fromm set out his vision of a «healthy society»: «Our security is laid out smartly and healthily of thinking. This implies realism oriented towards the mind, which knows the facts about the enemy and of himself, judging by the probability not only based on possibilities, but also on the re-examination of the facts, but not admired by future projects, servants of self-justification» [6, p.127]. Speaking for a consistent policy of disarmament, he wrote: «It's about people! The present situation of mankind is extremely serious. The policy of elimination will never bring peace, it is very possible that it will destroy civilization and will undoubtedly destroy democracy even if peace was saved. The first steps to address the danger of an atomic catastrophe and the preservation of democracy are to unite for global disarmament» [6, p.127].

The third form of E. Fromm's political activity: articles and books, on the one hand, have an educational character; on the other – it contains an analysis of the actual political situation. In the work «The Concept of Man in K. Marx» (1961), Fromm researches the thinking of K. Marx and publishes the most important parts of the «Economic Philosophical Manuscripts of 1844» and «German Ideology» (1845–1846). Having made a huge impression on his publication on American neo–Marxists, he became the largest figure for them (Note: In America, during the Cold War and anti–communism, there was no English translation of Marx's early works, only in 1959, a translation appeared in England, made in the Soviet Union by T.B. Bottomor (born 1920), an English sociologist of the neo–Marxist orientation, with whom E. Fromm was in great friendship). Fromm, anxious for the fate of mankind, tried to expose certain

or other fictions of American and Soviet foreign policy, using the means of the psychoanalyst in the analysis of the historical process. «The Soviet Union» writes E. Fromm «is a conservative totalitarian state of managers, not a revolutionary system that seeks world domination» [6, pp.127-128].

The fourth form of political activity E. Fromm: collective or personal appeals to politicians and statesmen, signatures under relevant resolutions, participation in political movements. In 1965, Fromm organized an exchange of views among socialist–humanists from different countries in the form of a collection of articles entitled «Symposium on Socialist Humanism». Ernst Bloch, Bertrand Russell, Leopold Senghor, Herbert Marcuse, Daniel Dolce, T.B. Bottomor, Irving Fetcher, as well as socialists Mikhail Markovich, Gayo Petrovich, Predrag Vranitsky and Adam Schaff in their articles showed that, in addition to the capitalist model of socialism, there is also humanistic socialism, the most important of which is a free, intelligent and loving person as the ultimate goal.

Especially close contacts E. Fromm supported with Yugoslav philosophers and sociologists of the «Praxis» group in Belgrade and Zagreb. Social support for the theoretical discussion around the «Yugoslav model» was obtained by the socio–psychological analytical approach of Erich Fromm and his concept of «social character». Fromm's concrete work finds expression in his attempt in 1957, with the help of Martin Buber, Naum Goldman, Ernst Simon and Din Pike, leaders of the Protestant Church in New York, to set up a committee that aims to return the Arabs to their former possessions. He later became a member of the Committee on New Alternatives in the Middle East and the National Committee of the American Association for Civil Liberties, and also widely collaborated in the Washington Institute for Peace Research. In 1968, Fromm took an active part in the campaign to nominate a humanist–minded senator – Eugene McCarthy, who opposed the Vietnam War. Although the outcomes of Fromm during the election campaign could not prevent Nixon from joining the Vietnam War, nonetheless, it was «an unprecedented Crusade in America» [6, pp. 131-132], which proved that a significant portion of the American population is ready for a humanization and is waiting for it. The book «The Revolution of Hope» emerged as a battle sheet in the election campaign for Y. McCarthy's presidency. Erich Fromm is convinced that a person can see himself in the true light if he can critically evaluate what is happening in the world. «It's impossible to see reality at one point if the rest of the world is closed from you», says E. Fromm [5, p. 65].

A political person always shows not only interest but the passion in all matters. Fromm opposes the ministry of intellectuals to any political party. Their task is to seek the truth in any way, to find the truth, and to speak the truth only. «Political progress depends on how much truth we know, how clearly and boldly we can express it and what part of it will inspire people» [5, p. 66]. He was not among the people who fear freedom and prefer to keep the illusion. Feeling extraordinary interest in politics, he tried not to depend on illusions in any sphere of life, believing that «a lie makes a man dependent, makes him hold on to any party, and only the truth ultimately leads to complete liberation» [5, p. 68]. The depth of the approach of E. Fromm is manifested, first of all, in the fact that he reveals the ethical and humanistic aspects of society, examines the global problems of the present in a broad socio–humanistic context.

The particular respect is the principledness of his vital position – «humanistic radicalism». Doubts, the power of truth, humanism – the guiding principles in the activity of both an individual and society as a whole. These principles are, according to Fromm, a triune formula and a reflection of the fundamental ideas embodied in Marx's short words: «Give in all doubts», «Truth will lead to release», «Nothing human is alien to me» [4, pp. 291-292].

From all the radical humanists from the times of Marx, Erich Fromm distinguishes the following: Toro, Emerson, Albert Schweitzer, Ernst Bloch, Ivan Ilyich; Yugoslav philosophers from the Praxis group – M. Markovich, G. Petrovich, S. Stoyanovich, S. Supek, P. Vranitsky; economist E.F. Schumacher; politician Erhard Eppler and many other representatives of religious and radical–humanist unions in Europe and America of the 20th century. Their views coincide in the following:

- 1) The relationship between man and nature must be based not on exploitation, but co-operation;
- 2) The production must serve a person, not an economy;
- 3) Antagonisms must be replaced everywhere with the solidarity relation;
- 4) The highest goal of all social measures should be human good and the prevention of human suffering;
- 5) The health and welfare of man serves not the maximum consumption, but only reasonable;
- 6) Every person should be interested in active activities for the benefit of other people and involved in it.

The concept of Fromm's humanism is based on the idea of human nature, inherent in all human beings. His views on «humanistic radicalism» E. Fromm prescribes in the «Foreword» in the book of Ivan Illich «Triumph of the Mind» [2, pp.4-8].

«Radicalism» for E. Fromm is, above all, an approach that can be characterized by the motto «de omnibus dubitandum», that is, everything must be questioned, especially those ideological concepts that virtually all are accepted by faith and, as a result, take upon themselves the role of indisputable, consistent with common sense, axioms. Under the «doubt» in this case, one does not need to bear in mind the psychological state of a person, which does not allow her to come to decisions or beliefs (for example, the doubt is based on an obsessive idea). According to Fromm, «to doubt» means being able to critically examine all the assumptions and established laws that have become a subject of blind worship under the guise of common sense, logic and what is considered natural and understandable.

Radical doubt is possible if a person expands the possibilities of his consciousness, penetrates the unconscious side of the course of their thoughts. «Radical doubt» is the discovery and disclosure, a gradual realization that his great goals for existence are no more than the fruit of human imagination. Radical doubt, according to Fromm, does not necessarily mean a denial, although it implies a rejection of faith. It is easy to deny, simply asserting the inverse of an existing one. For us, it is deeply important that radical doubt is dialectical: it covers the process of struggle against opposites and aspires to a new synthesis – to deny and assert. The radical doubt is the process of liberation from idolatrous thinking, the process of expanding consciousness, the process of the figurative, creative vision of a person of his possibilities, of his choice.

Erich Fromm focuses on global thinking, which is based on the implementation of the principle of humanistic radicalism, which opens up multiple prospects for the development of the wealth of human nature. Fromm himself had such thinking. Thanks to his efforts (along with the efforts of his supporters and followers), the scientific–theoretical and socio-psychological turn to the anthropological dominant was carried out [1, p. 74].

Conclusions.

1. A valuable priority of humanitarian branches of knowledge with the breadth of anthropological issues is the fact of today. The case started by Erich Fromm not only has not lost its significance but also because of the scale and humanist orientation, requires its continuation both in human research activities and in its everyday socio–cultural life in general, while maintaining a dialogic relationship with the world.

2. The breadth of views, dialogic thinking and high tolerance of E. Fromm is a valuable basis for the unification of scientists from the twentieth and twenty centuries to further develop and implement his project of «humanistic radicalism». Philosophical studies of the philosopher, is the bearing theoretical construct for many philosophical studies both in our country and abroad, can be used as the basis for the practical implementation of the projects of creation of man by various social institutions.

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PUBLIC ADMINISTRATION

STRATEGIC DIRECTIONS FOR DEVELOPMENT OF WATER SUPPLY AND WASTEWATER SPHERE OF UKRAINE

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ABSTRACT

The article considers the need for the development of a Strategy for the development of the water supply and wastewater sector in Ukraine. The author of the article argues that without a strategy, the effective functioning and development of the water supply and wastewater system is impossible. Strategic planning in the field of water supply and wastewater of Ukraine is the development of a vision of a key element of modern management, which the state considers as the development of the water supply and wastewater sector in the future. The concept and essence of strategy in general are analyzed, the vision and mission of the sphere of water supply and wastewater of Ukraine are determined. The Strategy of development of the sphere of Ukraine till 2020, external and internal institutions that influence the vectors of development of the water supply and wastewater sector are considered. The author presents the priority goals of the development of the water sector, identified by international organizations over the past five years. The author proposes strategic directions for the development of the water supply and wastewater system with the justification of their implementation.

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Introduction. Today, the directions of strategic development of Ukraine are defined in the Strategy of sustainable development of the country by 2020 [8]. The aim of the Strategy is to introduce European standards of life in Ukraine and Ukraine's emergence in leading positions in the world. For this purpose, the movement will be carried out according to the following vectors: 1) the vector of development – is the provision of sustainable development of the state, structural reforms and, consequently, the improvement of living standards. Ukraine should become a strong economy with advanced innovations. First and foremost, it is necessary to restore macroeconomic stability, ensure sustainable growth of the economy in an environmentally sound way, create favorable conditions for economic activity and a transparent tax system; 2) the vector of security – is the provision of security guarantees of the state, business and citizens, the protection of investments and private property. Ukraine should become a state capable of protecting its borders and ensuring peace not only in its territory, but also in the European region. The defining basis for security should also be the provision of fair and impartial justice, the urgent need to clean up power at all levels, and ensure the implementation of effective anti-corruption mechanisms. Particular attention should be paid to the safety of life and health of a person, which is impossible without effective medicine, the protection of socially vulnerable groups of population, the safe state of the environment and access to quality drinking water, safe food and

manufactured goods; 3) the responsibility vector is to ensure that every citizen, regardless of race, color, political, religious or other beliefs, gender, ethnic or social origin, property status, residence, language or other characteristics, will have access to high-quality education, healthcare systems and other services in the public and private sectors. Territorial communities will independently decide on issues of local importance, their well-being and will bear responsibility for the development of the entire country; 4) the vector of pride - is the provision of mutual respect and tolerance in society, pride in its own state, its history, culture, science, and sport. Ukraine should take a worthy place among the leading countries of the world, create decent living and working conditions for the education of its own talents, as well as attracting the best world specialists from different fields [8].

The strategy envisages the implementation of 62 reforms and state development programs within the framework of the four vectors of the movement, the closest to the sphere of water supply and wastewater being the reform of housing and communal services and the program of environmental protection. It should be noted that the strategies of housing and communal services, water supply and wastewater, and water sector development have not yet been developed and approved, which in our opinion is a serious problem in the development of water supply and wastewater. Ukraine has access to water resources available to low-income countries of Europe and the world, so water issues, water use and water use are of vital importance to Ukraine. Issues of efficient management of enterprises in the sphere of water supply and wastewater, consumer rights protection, ensuring sustainable and reliable water supply are also relevant.

Purpose of the study: The purpose of the paper is to determine the strategic directions of the development of the water supply and wastewater sector in Ukraine.

Research results. In essence, strategic planning should be understood as a process aimed at developing and implementing an environment development strategy in which one or another object exists; strategic planning is a process aimed at the future, which defines goals and directions of development, methods and means of achieving these goals; strategic planning - a process that is programmed for future events, level; strategic planning is a cyclical process that involves analyzing and adjusting the implementation of the strategic plan at the stages of its implementation [3]. Thus, strategic planning in the field of water supply and wastewater of Ukraine is the development of a vision, a key element of modern management, which the state sees in the future development of the water supply and wastewater sector.

Definition of the mission of the development strategy of the water supply and wastewater system and the state regulation of the water supply and wastewater system, the conceptual vision of the approaches to its implementation, formation of strategic development priorities, goals, tasks and mechanisms for their implementation should be based on the capacity of the industry to ensure the stability and reproductive capacity of the economic system, The implementation of a number of social and security problems of the country, taking into account those external and internal priorities and threats that before it appeared. The mission of the water supply and wastewater sector development strategy should be based on the general mission of the development strategy of Ukraine.

In general, we can say that the institutional structure in the field of water supply and wastewater of Ukraine corresponds to certain examples of European models. But, in practice, there are problems with the functioning and development of the water supply and wastewater sector. These include the following institutional problems: 1) the deformity of the institute of effective owner in the communal sphere; 2) low-quality legal support for the functioning of the water supply and wastewater sector; 3) the deformity of the rule of law; 4) ineffective financial and economic policy of the state; 5) uncertainty about the legal status of the state regulator (NKREKP); 6) imbalance of relations between local self-government bodies, state regulator, water supply and wastewater companies; 7) politicization of regulatory processes; 8) opacity and complexity of tariff policy; 9) the problem of availability of services; 10) deformity of social ideology; 11) lack of personnel policy in the field.

Other important institutions that shape the development of the water supply and wastewater system are the international commitments of Ukraine in this area or related fields. In particular, in the area of water use and protection and the reproduction of water resources: 1) Global Sustainable Development Goals (SDG), approved in 2015 at the UN Summit on Sustainable Development [10]; 2) Association Agreement between Ukraine and the EU (ratified by the Law № 1678-VII (2014, September 16) [9]; 3) the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the so-called "Water Convention" (ratified by the Law №801-XIV (1999, July 1); 4) Protocol on water and health (№ 1066-IV (2003, July 9); 5) multilateral and bilateral international agreements on the protection and use of transboundary water bodies and cooperation in the field of

water management at border waters, stipulated by Article 9 of the Water Convention; 6) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters "(ratified by the Law № 832-XIV (1999, July 6).

The impact of global water policy in the world is evident in a number of international instruments. In particular: 1) Principles of the Organization for Economic Cooperation and Development (OECD) on water governance approved by the OECD Regional Development Policy Committee (2015, May 11), supported by the Ministers during the meeting of the OECD Ministerial Council (2015, June 4). (The organization unites 35 most economically developed countries of the world - Most of the EU, US, Australia, Switzerland, Norway, South Korea, Japan, and others, as well as actively cooperates with non-member countries (in particular with Ukraine) within the framework of specialized programs international dnyh events, etc.) [7]; 2) The objectives of the Sixth World Water Forum (2012, March) [7]; 3) World Water Forum [2], etc.

Table 1 shows the priority objectives of the water sector, identified by international organizations over the past five years.

Table 1. Priority objectives of the water sector of Ukraine, identified by international organizations

Goals	Document
1	2
<p>Clean water and proper sanitary conditions:</p> <p>1) To ensure availability of quality services for the supply of safe drinking water, construction and reconstruction of centralized drinking water supply systems with the use of the latest technologies and equipment;</p> <p>2) Ensure the availability of modern wastewater systems, construction and reconstruction of water intake and wastewater treatment plants using the latest technologies and equipment;</p> <p>3) To reduce the volume of discharge of untreated wastewater, first of all using innovative water purification technologies at the state and individual levels;</p> <p>4) To increase efficiency of water use;</p> <p>5) Ensure the implementation of integrated water resources management;</p>	<p>Global Sustainable Development Goals (SDG)</p>
<p>Improving the effectiveness of water governance</p> <p>1) Clearly identify and distinguish roles and responsibilities for water policy development, policy implementation, operational management and regulation, and facilitate coordination between these responsible bodies.</p> <p>2) Manage water at the appropriate level within integrated basin governance systems to reflect local conditions and facilitate coordination between different levels;</p> <p>3) Encourage policy coherence through effective cross-sectoral coordination, especially between policies on water and the environment, health, energy, agriculture, industry, spatial planning and land use;</p> <p>4) Adapt the level of capacity of the responsible authorities to the complexity of water-related challenges and the set of competences required to fulfill their responsibilities. Improving the effectiveness of water governance</p> <p>5) Create, update and share timely, consistent, comparative and policy-related data and water information, and use them to guide, evaluate and improve water policy;</p> <p>6) Ensure that public authorities contribute to the mobilization of water funding and the efficient, transparent and timely allocation of financial resources;</p> <p>7) Ensure the effective implementation and application of appropriate water resource management systems to achieve public interest;</p> <p>8) Promote the adoption and implementation of innovative methods of water governance in relevant government bodies, government levels and stakeholders; Increasing trust and involvement in water governance</p> <p>9) Strengthening Integrity and Transparency Practices in Water Policy, Water Institutions and Water Governance for greater accountability and decision-making confidence.</p> <p>10) Contribute to stakeholder engagement for informed and goal-oriented contributions to water policy formulation and implementation</p> <p>11) Promote the development of water governance systems that help to achieve compromises among water users, rural and urban areas and generations</p> <p>12) Facilitate the regular monitoring and evaluation of water policy and governance, where appropriate, publicize and, if necessary, make adjustments</p>	<p>Principles of the Organization for Economic Cooperation and Development (OECD)</p>

Continuation of Table 1.

1	2
<p>1) By 2015, 50% of countries will adopt consultation, participation and coordination mechanisms that will enable stakeholders at the local, regional, national and international levels to effectively promote the adoption of coherent, holistic and integrated solutions. By 2021, 100% of countries will be involved.</p> <p>2) By 2015, 50% of countries will strengthen the regulatory framework and adopt performance indicators (services) for monitoring and assessing water policy; all countries will implement capacity-building processes at the national and local levels to promote good governance in the provision of services. By 2018, all countries will be involved.</p> <p>3) By 2021, increase the number of river basin management plans by 30% (analysis of the initial state and main issues).</p> <p>4) By 2015, increase the number of countries with water safety diagnosis and governance tools based on existing (local, national, international) regulatory and legislative frameworks and IWRM mechanisms.</p> <p>5) By 2018, 30 countries are committed to promoting water sector targeting, diagnose / reflect existing or potential corruption risks and ensure proper and effective anti-corruption policy.</p> <p>6) By 2018, transparency in budgetary processes in the water sector will be implemented in 30 countries, including information on planning and implementation of investments in water infrastructure (financial, technical and socio-economic impacts); as well as methods and tools for increasing transparency and accountability in the water sector.</p>	The objectives of the Sixth World Water Forum
<p>1) Ensure access to water and the right to water for all.</p> <p>2) Improve access to the complex of sanitary facilities for all.</p> <p>3) Contribute to improving hygiene and health through water and wastewater.</p> <p>4) Prevent and respond to water-related risks and crises.</p> <p>5) Promote co-operation and peace through water</p> <p>6) Balance the multilateral use of water resources through the introduction of integrated management of them.</p> <p>7) Provide food security through optimal water use.</p> <p>8) Adopt plans for the development of hydropower and their ability to provide available water resources.</p> <p>9) Support environmentally-oriented economic growth.</p> <p>10) Improve the quality of water resources and ensure the sustainability of ecosystems.</p> <p>11) Regulate the activity of a person who exerts pressure on water.</p> <p>12) Adapt to the climatic and global changes in the urbanized world</p>	World Water Forum
<p>Cooperation with the EU with the goals:</p> <p>1) the development of a comprehensive environmental strategy that will include planned institutional reforms (with specified deadlines) to ensure the implementation and implementation of environmental legislation; the division of powers of environmental authorities at the national, regional and local levels; procedures for decision-making and their implementation; procedures for promoting the integration of environmental policy into other areas of state policy; the definition of the necessary human and financial resources and the mechanism for their revision;</p> <p>2) development of sectoral strategies in the field of improving air quality; water quality and water management, including the marine environment; waste management and resources; Protection of Nature; industrial pollution and industrial accidents; chemicals, including clearly defined timelines and key stages of implementation, administrative responsibility, as well as financial strategies for attracting investment in infrastructure and technology;</p> <p>3) the development and implementation of climate change policies, in particular, as defined in Annex XXI to this Agreement.</p>	Association Agreement between Ukraine and the EU

Compiled by the author based on [2; 7; 9; 10].

Thus, the existing state policy in the sphere of water supply and wastewater of Ukraine should be reviewed taking into account the shortcomings identified during the reform of the industry, as well

as taking into account the current priorities of the country's strategic development and all spheres of the economy. In particular, the priorities of development of the state policy in the field of water supply and wastewater (Strategy for the development of water supply and wastewater) should be:

1) ensuring the reliable functioning and sustainable development of the water supply and wastewater system. Provided by organizing the work of water supply and wastewater companies as a whole, work on preventive maintenance of water supply and wastewater systems and networks, planned reconstruction and overhaul of worn-out funds, introduction of new technologies, prevention of emergencies, etc., with an effective investment policy, and with the policy of paying off payables. In particular, one of the options for solving the problem of preventing the emergence and growth of payables may be the exclusion of the provisions of the Law of Ukraine On Drinking Water, Drinking Water Supply and Wastewater (2002, January 10) in connection with the prohibition of water supply restrictions for consumers (the population). The above changes will allow enterprises of water supply and wastewater to be disconnected from centralized water supply and wastewater of non-payers. In our opinion, in our opinion, there is no more effective model of combating non-payment and prevention of arrears, as well as the formation of a social ideology for compulsory payment of services. Such an approach would not be a violation of human rights to water, guaranteed by the Constitution of Ukraine, since the state does not restrict consumer access to water supply sources (as subsoil), and also provides consumers with free decentralized water supply from well-equipped pump rooms (a free alternative to paid central water supply services);

2) ensuring safe water supply and wastewater. It is carried out by creating a system of functioning of the water supply and wastewater system, water infrastructure of the country, in which all consumers should have constant uninterrupted access to water supply and wastewater services in an acceptable quantity and quality for health, livelihoods and production, in combination with an acceptable level of possible risks, associated with water. In addition, water supply and wastewater facilities are critical infrastructure objects. Enhancing the security and stability (reliability) of the national critical infrastructure in relation to all risks and threats is a strategic objective of the national security policy, since it is the critical infrastructure that provides vital services for the population, society and state, without which it is impossible to exist and develop. Thus, safe water supply and wastewater should be determined by the principle of state policy in the field of water supply and wastewater (not only in relation to the quality of drinking water), with the introduction of a risk management system in the field of water supply and wastewater related to various threats. The uncontrolled risk management framework for threats to safe water supply and wastewater should include identifying, analyzing and assessing the risks associated with threats, identification of likely consequences, causes of their occurrence and development scenarios, monitoring system and the use of warning and / or minimization of negative consequences [4];

3) creation of a legitimate balanced effective model of state regulation in the field of water supply and wastewater. It is carried out by creating an effective model of regulation in the field of water supply and wastewater, taking into account the following factors. The model should be: legal, flexible, maintain a balance of interests between enterprises, consumers, local governments and the state represented by the regulator. The factor of legality should be manifested in the legal status of regulators. In particular, the legal status of a state regulator must be in line with the Constitution of Ukraine, which defines a clear division of powers into legislative, executive and judicial. No regulators, supervisors and other bodies do not define the current version of the Constitution of Ukraine. Therefore, the state regulator in the field of water supply and wastewater should relate to the executive authorities, which clearly establish the procedures for the establishment, liquidation and operation. Another way of solving the problem of the legal status of the state regulator (as well as AMCU, the Institute of the President and the Prosecutor's Office) is to amend the Constitution of Ukraine by introducing another principle that can be fully implemented, namely: the principle of separation of functions of power into legislative, judicial, regulatory, controlling, law enforcement, information, etc. [1; 5]. At the same time, the independence of the state regulator will be guaranteed by its independence and independence in decision-making, which will be sustained by a system of checks and balances.

Under the effective regulatory influence of the state on processes in the field of water supply and wastewater should be understood as a balanced approach with the use of tools and methods of state regulation. At the same time, the model of regulation is chosen depending on the strategic direction of the state's development. Or regulation is carried out at the level of local self-government bodies, which by law are obliged to provide the community with communal services and who are owners and managers of communal property of water supply and wastewater companies. In this case,

the body of local self-government assumes the responsibility for the implementation of state policy in the sphere, both for providing the population with services and for the effective functioning of enterprises, which will correspond to the state policy of decentralization. Or the regulation is carried out at the state level. In this case, the formation of a state regulator shows the distrust of the state to local self-government, which is supported by the following arguments: the weak level of local self-government bodies (financial, personnel and organizational), inactive community position, corruption actions of local self-government bodies, etc. However, such a model should not be permanent and should correspond to the state of development of the water supply and wastewater sector at certain stages. In the case of strengthening the role of local self-government bodies, the role of the state regulator can be changed and reviewed;

4) preservation of water bodies and ecosystem sustainability. Environmental safety in the field of water supply and wastewater involves such a state of production of water and wastewater services, which prevents the deterioration of the environmental state of the environment and water resources and the emergence of danger to human health. Environmental security in the sphere of water supply and wastewater can not be ensured without the use of integrated institutions and measures of state policy and approval of the strategy of development of the water supply and wastewater sector with short-term and long-term measures. In the same reform of the water supply and wastewater sector, bringing it in line with European standards (in terms of environmental safety and environmental protection) requires significant financial investments in the modernization and / or construction of new water supply and wastewater facilities, replacement of technologies ; institutional changes in terms of clearly defining the powers of local self-government bodies in the management and regulation of water supply and wastewater facilities; improvement of the normative base in the field of water supply and wastewater;

5) ensuring the availability of centralized water supply and wastewater services. Under availability, such a level of tariffs for water and wastewater services is understood that would ensure the financial stability of enterprises and at the same time acceptable for the society both from economic and social positions. Priority of the availability of water and wastewater services should also be a priority area of the state social policy, and be monitored continuously. To this end, state policy should envisage legal and institutional changes in order to create a state body with the powers to monitor and analyze the availability of public utilities in the country, the social perception of tariff formation and sphere reform and the creation of a united information base on the availability of utilities and analysis. Today, certain data on accessibility and social perception are analyzed by various bodies, research institutes, individual researchers under individual orders. At the state level, such a function, for example, can be performed by the main body in the system of central executive authorities, which ensures the formation and implementation of state policy in the sphere of housing and communal services. And information on the availability of services and social perception should be placed in the annual National Report on the quality of drinking water;

6) protection of consumer rights. It is implemented through the formation and implementation of a consumer-oriented state policy. The objectives of the state policy in the field of water supply and wastewater in order to protect the rights of consumers should be: health, safety and economic interests of consumers, as well as the maintenance of consumers' right to information, education, the right to create organizations and conditions for the protection of consumers' interests. The principle of state policy on the protection of consumer rights in the field should be effective and implemented with the help of well-defined mechanisms and institutions. In particular, the institutional framework for ensuring consumer rights in the field of water supply and wastewater should include: the availability of organizational structures of different forms of ownership for the protection of consumer rights; availability of service standards; availability of alternative models of settling disputes; information and consulting support; scientific and methodological support; monitoring and control of consumer rights protection; creation of an effective institute of responsibility and restoration of violated rights; etc. Creation of the following conditions for the protection of consumers' rights in the field of water supply and wastewater : creation of the Institute for consumer protection (the lawyer / consumer ombudsman institution); definition of effective alternative mechanisms for pre-trial settlement of disputed issues; orientation of consumer policy in support of consumer interests and ensuring a high level of their protection; approval of models for resolving situations where there is a violation or threat of violations of the rights of a large number of consumers; approval of consumer service standards (from the standard of provision of services for centralized water supply and wastewater to the standard for processing claims, consumer complaints); development of practical manuals for service users; etc.

7) ensuring the quality of drinking water and quality water supply and wastewater services. It is implemented through the formation and implementation of a consumer-oriented state policy. The subject of state regulation in the field of water supply and wastewater should be not the activities of water supply and wastewater companies, and the final result of their activities, that is, the service of proper quality and quantity. Accordingly, standards of quality of service should be developed, effective balanced mechanisms of realization of consumer rights and water supply and wastewater enterprises, simple and accessible mechanisms for restoration of violated consumer rights concerning quality, etc.

8) ensuring rational water use. It is implemented through the introduction of water-saving technologies and rational water use. Potable water supply remains a priority water use. In the field of industrial water use it should be envisaged introduction of new technological processes and the introduction of low-water and anhydrous technological processes and other technologies for reduction of specific water consumption (for example, application of systems of dry cleaning of gases and air of aspiration systems from dust, use of evaporative cooling, pneumatic and pneumatic and hydraulic systems of transportation allows to reduce specific water consumption by an average of 20-30%). Creation of closed water supply systems in which there is a reduction in the consumption of fresh water from natural reservoirs due to their multiple use in circulating water supply and reuse systems (which will reduce the number of fresh water and reduce the discharge of waste water in the reservoir). The mentioned priority also involves the introduction of water audit and water management institutes (such as definition of reduction of water resources use, minimization of leakages and losses) with the formation of institutional constituents – mechanisms, procedures, rules, requirements for specialists, training, certification and certification, etc. In the case of establishing specific targets for reducing specific water consumption, water audit should determine how to ensure efficient water use and reduce losses and costs of drinking water during its extraction, purification, transportation and consumption. In addition, the water audit should determine the goals of sustainable development of the water supply and wastewater system of the settlement, region, etc. The authority of the water audit will include: inventory of water use (full understanding of where and how the organization, enterprise, household uses water, identification of the water supply and wastewater system, capacity, technical condition, etc.); accounting (implementation of various measurements of water consumption based on indicators of water supply accounting, indicators of similar objects, consumption norms, etc.); preventive maintenance to improve the efficiency of the system while reducing operating costs (inspection of cranes, valves, pipes, cooling systems, etc.); Educational activities on consumer policy and consumer rights; development and implementation of a water saving plan (action plan for reducing water use); analysis of the implementation of measures defined in the plan of water saving;

9) personnel policy. It is provided through the implementation of institutional mechanisms for ensuring personnel policy and a competent approach in the field of water supply and wastewater. The current state regulation in the field of water supply and wastewater should also include methods aimed at efficient management of the sphere of enterprises and efficient operation of the water supply and wastewater system. In the process of training specialists in the field of water and wastewater are taken by the state, educational institutions, enterprises-employers. And the main thing that should create a state is a continuously coordinated process of training and professional development of industry professionals. In which, at the legislative level, the requirements for the qualification of the personnel of the water supply and wastewater enterprises will be clearly defined, and the interaction of all participants in the process: educational institutions that ensure the implementation of educational programs and form competence of graduates and may be accompanied by advanced training; employers' enterprises, which form requirements for the competence of graduates, participate in the development of professional standards, curriculum, certification; profile ministries that implement state policy in the field and agree on curricula to meet current state policy and reform requirements [6];

10) formation of the institute of effective owner in the field of water supply and wastewater. The most important task of the state - protection of property relations, their clear legal regulation, protection of the rights of owners from any unlawful interference. Therefore, all normative documents on property should be clear, direct and non-alternative (do not allow double interpretation and controversial issues). Ownership is the basis of economic relations in the country, guarantee of seriousness of intentions, commitments made, etc. The property requires the owner to keep it properly, which involves reasonable expenses. At the state level, state ownership and communal property should be clearly defined and distinguished. In addition, the formation of the institution of an effective owner in Ukraine should provide for a departure from the post-Soviet regime of property functioning, which stimulates the choice of the owner in favor of obtaining "fast" money from the transfer of property and utilization of communal property for individual interests, to an efficient regime for obtaining income from the exploitation of

property. These transformations can not always be solved through legal regulation. In the case when the authorities of the subjects regarding the disposal of property become an obstacle to the realization of the political interests of the authorities, the decision may be political or administrative influence. It is important to note that the illegitimacy of property in Ukraine is one of the factors of the conservation of structural and technological backwardness of production. Even inventing sufficient resources for modernization without solving the problem of legitimizing property will not allow overcoming the backwardness of the development of the water supply and wastewater sector. Illegitimacy of property will always be the root cause of the blurriness and instability of rights to it, and therefore the source of distorted motivation of economic agents and ineffective (from the point of view of public interests, in this case, connected with structural and technological modernization) the allocation of their resources;

11) formation of social ideology and culture. It is implemented through institutional system reforms that involve organizing the formation of social ideology in the field of water supply and wastewater (availability of services, rational water use, economy, service fees, protection of consumer rights, orientation of state policy, principles of state regulation, mechanisms of tariff formation, etc.) through a system of educational institutions, system of self-education, use of mass media and the Internet. The ideology should be such that the higher the level of social culture of citizens, the more complete people will be informed about the rules of the game in the field of water supply and wastewater (as well as in the field of communal services), the more responsible they will be to their commitments and to the main policies state in the field of water supply and wastewater ;

12) provision of construction, modernization and renovation of fixed assets of water supply and wastewater enterprises (with introduction of the latest technologies);

13) ensuring an effective investment policy;

14) the formation of a holistic national innovation system.

Conclusions. The strategy of development of water supply and wastewater of Ukraine is an important element of state policy, without which the development of the sphere is impossible. For decades, the state's policy has accumulated institutional problems that directly affect the water supply and wastewater sector and need to be addressed. In addition to institutional problems, the development of the sphere is also influenced by internal and external factors, in particular, the country's international obligations. The state policy in the field of water supply and wastewater of Ukraine needs revision and modernization taking into account the shortcomings revealed in the process of reforming the sector, taking into account the current priorities of strategic development of the country and all spheres of economy. In particular, the directions of the development strategy of water supply and wastewater include the vectors proposed in the article.

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