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PECULIARITIES OF IMMUNE STATUS IN THE PRESENCE OF SECONDARY IMMUNODEFICIENCY OF INFECTIOUS AND NON-INFECTIOUS ORIGIN IN WOMEN OF REPRODUCTIVE AGE

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Abstract.

Summary: The design of studies on the immune system does not have gender peculiarities, but the information about the higher frequency of pathology of the female reproductive system in the presence of immunodeficiency condition determines the purpose of this study, namely, to identify the features of immune status in the presence of secondary immunodeficiency of infectious (i.e., HIV infection, AIDS stage) and non-infectious origin (alcohol dependence syndrome) and their combination in women of reproductive age.

Materials and methods: The material for the study of cellular and humoral immunity was a lymphocyte suspension obtained by centrifugation of peripheral blood (taken within 12 hours after death) in women of reproductive age with HIV infection (AIDS stage), alcohol dependence syndrome and their combination. Immunological examination included the determination of quantitative indicators of cellular immunity using monoclonal antibodies: T-lymphocytes (CD3) and their main subpopulations of T-helper cells (CD4), cytotoxic lymphocytes (CD8), CD4/CD8 immunoregulatory index; as well as indicators of humoral immunity: B-lymphocytes (CD19) and immunoglobulins of the main classes (IgA, IgG, IgM). Additionally, interleukins IL-6 and IL-10 were studied to determine the parameters of the cytokine profile.

Results: The study indicates (Table 1) that the number of leukocytes and lymphocytes in the group of deceased women with alcohol dependence syndrome was $3.6\pm0.38x10^9$ /l and $0.82\pm0.35x10^9$ /l; in deceased women with HIV/AIDS, these indicators were reduced – $2.9\pm0.03x10^9$ /l and $0.39\pm0.04x10^9$ /l, respectively; and in deceased women with combined pathology (AIDS and alcohol dependence syndrome), they were reduced even more intensively – $2.7\pm0.04x10^9$ /l and $0.35\pm0.06x10^9$ /l ($p<0.01$). Compared to the control group – $5.22\pm0.4x10^9$ /l and $1.73 \pm 0.21x10^9$ /l – the number of leukocytes and lymphocytes was reduced in all study groups. In the group of deceased women with alcohol dependence syndrome, significant impairments in the proliferative activity of T-lymphocytes (CD3) and their subpopulation (CD4), as well as B lymphocytes (CD19) and natural killer cells (CD16) were found compared to the group of healthy individuals. Thus, in the control group, the percentage, and absolute values of CD3 were 60.37±4.2% and $1.04\pm0.05 \times 10^6$ /l, and in women suffering from chronic alcoholism, they were statistically significantly lower – 49.1±3.1% and $0.42\pm0.08 \times 10^6$ /l, respectively, $p<0.01$. The same tendency was found when comparing the values of T-helper cells (CD4) in the control group (44.2±2.9% and $0.76\pm0.13 \times 10^6$ /l) and in deceased patients suffering from chronic alcoholism (33.7±4.6% and $0.28\pm0.23 \times 10^6$ /l), $p<0.01$.

Conclusions: Secondary immunodeficiencies of infectious and non-infectious origin in women (in particular, those formed in HIV/AIDS, alcohol dependence syndrome and their combination) are characterized by negative changes in the cellular and humoral components of the immune system, as evidenced by the presence of transient immunodeficiency, activation of cytolytic and auto aggressive reactions. As a result of these processes, systemic and organ pathology develops, in particular, weakening of the body's resistance to various infections and pathological changes in organs and tissues, which may be one of the links in the development of pathological processes in internal organs and tissues.

Key words. Secondary immunodeficiency, infection, HIV/AIDS, addiction, chronic alcoholism, immune system.

Introduction.

Secondary immunodeficiency states (SIDS) are much more common than primary immunodeficiencies [1,2], and are the result of many factors that can affect an organism with a healthy immune system: infectious agents, medications, metabolic disorders, environmental conditions, and bad habits [3,4]. These SIDSs are clinically manifested by an increased frequency or unusual complications of common infections and sometimes opportunistic infections [5,6]. Secondary immunodeficiencies have a wide range of manifestations depending on the severity of external damaging effects and the susceptibility of the body [7,8].

Secondary immunodeficiency can be defined as a transient or persistent impairment of the function of immune system cells or tissues caused by factors outside the immune system [1,9]. Over the past five decades, the most studied secondary immunodeficiency is the acquired immunodeficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) infection [10,11].

SIDS is characterized by an acquired decrease in the number and/or function of immune cells. The most common type of SIDS is a decrease in antibody levels that occurs as a result of an underlying disease or as a side effect of medication. Paradoxically, immunodeficiencies initially attributed to secondary causes may partially be the result of an underlying primary immunodeficiency [12,13], which requires more detailed study. In particular, studies on the initial clinical manifestations of a confirmed immunodeficiency state indicate that most patients have a history of infection, but focusing solely on manifestations centered on infection might lead to overlooking patients who initially had other manifestations, such as immune dysregulation [14,15]. Among the diseases that can lead to the development of SIDS, HIV/AIDS and chronic alcoholism are the most common [16,17]. The combination

of these two pathologies is particularly dangerous [18,19]. Usually, the design of studies on the immune system does not have gender specifics [20,21], but information on the higher frequency of pathology of the female reproductive system in the presence of immunodeficiency condition [22,23] determines the purpose of this study, namely to identify the features of immune status in the presence of secondary immunodeficiency of infectious (we chose HIV/AIDS) and non-infectious origin (alcohol dependence syndrome) and their combination in women of reproductive age.

Materials and Methods.

We formed four groups of cases of women who died due to craniocerebral injuries (accidental causes). The group of secondary immunodeficiency of infectious origin consisted of 25 women with HIV infection, AIDS stage. HIV infection was verified by enzyme-linked immunosorbent assay (ELISA) with confirmation by western blot method. The group of secondary immunodeficiency of non-infectious origin consisted of 25 deceased women with alcohol dependence syndrome. The main feature of these women was the presence of alcoholic cirrhosis of the liver, as well as the relevant anamnestic data established during the interview of relatives. A group of 30 deceased women with a combination of HIV/AIDS and alcohol dependence syndrome was also formed. The fourth group was the control group, which consisted of 30 women who died of diseases not related to alcohol abuse, pathology of the reproductive system without concomitant HIV infection (those who died as a result of accidents). Tobacco smoking, contraceptive use (oral contraceptive pills), age at first sexual intercourse, somatic pathology, and number of pregnancies were not considered, as the principle of randomization was used in the recruitment of groups.

The material for the study of cellular and humoral immunity was a lymphocyte suspension obtained by centrifugation of peripheral blood (taken within 12 hours after death) on a ficoll-verigraphin density gradient (density 1.077 g/cm^3). Immunoglobulins of classes A, M, and G were determined by enzyme-linked immunosorbent assay using Hema test systems (Ukraine). The content of IL-6 and IL-10 cytokines in the patients' serum was determined by enzyme-linked immunosorbent assay using diagnostic kits (R&D Diagnostics Inc., USA), the sensitivity of the test systems being 4-5 pg/ml. To accomplish this, peripheral blood (5 ml) was taken with a syringe from the femoral vein of a deceased woman or the ventricles of the heart, centrifuged at 3000 rpm in the cold for 10 minutes. The serum was poured into 0.5 ml into an epidural tube, frozen and stored at -76°C until use; hemolyzed sera were not used [24]. The amount of cytokines was calculated by constructing a calibration curve using a computer program and expressed in pg/ml.

Immunological examination included the determination of quantitative indicators of cellular immunity using monoclonal antibodies: T-lymphocytes (CD3) and their main subpopulations of T-helper cells (CD4), cytotoxic lymphocytes (CD8), CD4/CD8 immunoregulatory index; as well as indicators of humoral immunity: B-lymphocytes (CD19) and immunoglobulins of the main classes (Ig A, Ig G, Ig M) [25,26]. Additionally, interleukins IL-6 and IL-10 were studied to determine the parameters of the cytokine profile. The CD68 marker, a transmembrane glycoprotein macrosialin (sialomycin), which is expressed on the surface of macrophages, neutrophils, monocytes, basophils, dendritic cells, and some B-lymphocytes, was determined.

Statistical processing of the data was performed using the Statistica for Windows, 8.0 software package. Methods of descriptive statistics (determination of numerical characteristics of variables – arithmetic mean (M), mean sampling error (m), determination of the reliability of differences (p), which were tested by Student-Fisher t-test in representative samples) were used. The criterion for statistical reliability of the findings was considered to be $p<0.01$.

Results and Discussion.

The study shows (Table 1) that the number of leukocytes and lymphocytes in the group of deceased women with alcohol dependence syndrome was $3.6\pm0.38x10^9$ /l and $0.82\pm0.35x10^9$ /l; in those who died with HIV/AIDS, these indicators were reduced – $2.9\pm0.03x10^9$ /l and $0.39\pm0.04x10^9$ /l, respectively; and in cases with combined pathology (AIDS and alcohol dependence syndrome), they were reduced even more intensively – $2.7\pm0.04x10^9$ /l and $0.35\pm0.06x10^9$ /l ($p<0.01$). Compared with the control group – $5.22\pm0.4x10^9$ /l and $1.73\pm0.21x10^9$ /l – the number of leukocytes and lymphocytes was reduced in all study groups.

Immunological parameters obtained during the study of all groups and the control group are shown in Table 1. In the group of deceased women with chronic alcoholism, significant impairments in the proliferative activity of T-lymphocytes (CD3) and their subpopulation (CD4), B /-lymphocytes (CD19) and natural killer cells (CD16) were found compared to the control group. Thus, in the control group, the percentage, and absolute values of CD3 were $60.37\pm4.2\%$ and $1.04\pm0.05\times10^6$ /l, and in deceased women with alcohol dependence syndrome, they were statistically significantly lower – $49.1\pm3.1\%$ and $0.42\pm0.08\times10^6$ /l, respectively, $p<0.01$. The same tendency was found when comparing the values of T-helper cells (CD4) in the control group ($44.2\pm2.9\%$ and $0.76\pm0.13\times10^6$ /l) and in the group of deceased with alcohol dependence syndrome ($33.7\pm4.6\%$ and $0.28\pm0.23\times10^6$ /l), $p<0.01$, Table 1.

The effect of HIV/AIDS on the immune system is characterized not only by a decrease in the total number of T-lymphocytes due to the subpopulation of CD4-lymphocytes, but also by the suppression of CD4 cell function. The CD4 counts in these deceased women ($25.3\pm2.2\%$) were statistically significantly lower not only than in the control group ($44.2\pm2.9\%$), but also lower than in the group with alcohol dependence syndrome ($33.7\pm4.6\%$), $p<0.01$, Table 1. The lowest values of helper T-lymphocytes (CD4) – 23.4 ± 1.4 % – were observed in the last group of HIV/AIDS and alcohol dependence syndrome. This might be due to comorbid disorders.

In all groups, there was a significant increase in cytotoxic T-suppressor (CD8), which in the control group was $15.3\pm1.2\%$, in the group with alcohol dependence syndrome – $18.3\pm0.7\%$, in those with AIDS – $23.2\pm1.6\%$, $p<0.01$, Table 1. It should be noted that despite a significant increase in this indicator in percentage terms, its absolute values, on the contrary, decrease,

Table 1. *Immunologic parameters in deceased women with HIV/AIDS, alcohol dependence syndrome, HIV/AIDS and alcohol dependence syndrome and in the control group (M±m).*

Immunological parameters – relative (%) and absolute numbers (x10 /l)[6]	**Control group, n=30**	**Group with alcohol dependence syndrome, n=25**	**Group with HIV/AIDS, n=25**	**Group with HIV/AIDS and alcohol dependence syndrome, n=30**
White blood cells, g/l	5,22±0,4	3,6±0,38	2,9±0,03	2,7±0,04
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01	p_{3-4} <0.01	
Lymphocytes, %.	32,9±3,3	23,3±2,3	13,4±0,04	13,2±1,2
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
Lymphocytes g/l	1,73±0,21	0,82±0,35	0,39±0,04	0,35±0,06
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
CD3 T-lymphocytes, %.	60,37±4,2	49,1±3,1	48,7±3,3	47,1±3,1
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01			
T-lymphocytes CD3 x10^6 /l,	1,04±0,05	0,42±0,08	0,19±0,03	0,16±0,04
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
CD4 T-helper cells, %.\	44,2±2,9	33,7±2,6	25,3±2,2	23,4±1,4
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
CD4 T-helper cells x10 /l, [6]	0,76±0,13	0,28±0,23	0,11±0,02	0,09±0,01
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
T-cytotoxic CD8, %.	15,3±1,2	18,3±0,7	23,2±1,6	23,8±1,6
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
T-cytotoxic CD8, x10 /l [6]	0,26±0,04	0,19±0,03	0,09±0,02	0,08±0,01
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
Immunoregulatory index, CD4/CD8	2,93±0,05	1,83±0,04	1,09±0,07	1,04±0,04
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01	p_{3-4} <0.01	
CD16 killers, %.	17,5±0,6	15,5±0,9	13,2±2,3	9,3±2,1
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01	p_{3-4} <0.01	
Killers CD16 x10^6, /l g/l	0,25±0,03	0,12±0,04	0,05±0,01	0,04±0,01
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
B-cells, %.	12,2±2,9	23,5±1,8	27,1±1,5	28,2±1,8
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
B cells x10^6, /l ch	0,21±0,05	0,19±0,03	0,11±0,02	0,09±0,03
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		

CD68, %.	22,3±3,4	15,2±1,9	10,4±1,1	10,1±1,2
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
CD68, x10 /l^6	0,38±0,05	0,13±0,04	0,05±0,01	0,04±0,01
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		

Note: n – number of women who died; p – significance level of the difference between the indicators.

Table 2. *Serum levels of immunoglobulins and cytokines in deceased women with HIV/AIDS, alcohol dependence syndrome, HIV/AIDS and alcohol dependence syndrome as well as the control group (M±m).*

Immunological parameters	**Control group, n=30**	**Group with alcohol dependence syndrome, n=25**	**Group with HIV/AIDS, n=25**	**A group with a combination of HIV/AIDS and alcohol dependence syndrome, n=30**
IgA, g/l	1,78±0,04	3,4±0,06	3,9±0,3	4,1±0,27
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
IgM, g/l	1,2±0,05	1,5±0,04	1,8±0,07	2,0±0,33
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
IgG, g/l	13,8±2,3	18,4±2,8	27,3±3,1	26,8±2,9
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01		
IL-6, pg/ml	3,7±0,11	7,5±1,4	28,5±6,2	19,1±1,3
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01	p_{2-3} <0.01 p_{2-4} <0.01	p_{3-4} <0.01	
IL-10, pg/ml	6,4±0,13	9,9±2,1	10,7±1,4	11,2±2,1
	p_{1-2} <0.01 p_{1-3} <0.01 p_{1-4} <0.01			

Note: n – number of patients; p – level of significance of the difference between the indicators.

as there is a prominent statistically significant decrease in the number of leukocytes in the blood of deceased women of all groups, p<0.01, Table 1.

The values of natural killer cells (CD16) in all groups were significantly lower than in the control group without pathology. In all groups, there was a decrease in the cytotoxic activity of killer cells and cell-mediated cytotoxicity (Table 1).

Alcohol consumption is stressful for the body and causes the formation of an adaptation syndrome. The mechanisms that underlie this complex process lead to a violation of not only the population and subpopulation composition of cells, but also their activation potential, in particular, there is a violation of the production of antibodies by B-lymphocytes (CD19). The percentage of B-lymphocytes in patients with chronic alcoholism is increased (23.5±1.8%) compared to the control group (12.2±2.9%), p<0.01, Table 1. However, it was found that in comparison with the control group, in the group of deceased women with alcohol dependence syndrome, the content of immunoglobulins of classes A (3.4±0.06 g/l), G (18.4±2.8 g/l) and M (1.5±0.04 g/l) in the blood serum was statistically significantly increased, Table 2. It should be noted that according to the literature, patients with alcoholism have impaired hemolytic activity of complement, changes in the content of C1, C3 and C4 components of the complement system, and increased levels of circulating immune complexes [27,28]. Thus, chronic alcohol abuse contributes to the emergence of a significant tension of the immune system, which, responding to constant external stimuli (alcohol intoxication), exhausts its reserves, which leads to the emergence of an immunodeficiency state. Significant violations of immunological parameters in the group with alcohol dependence syndrome revealed in the course of the study give reason to believe that one of the fundamental factors in the pathogenesis of alcoholism should be considered a violation of immune mechanisms in response to alcohol as the main etiological agent. It can be assumed that ethanol, in the case of excessive consumption, can act as a "pathogen", introducing serious changes and disorders in both the mechanisms of innate and adaptive immunity, and subsequently in the body systems as a whole.

A significant increase in the percentage and decrease in the absolute number of B-lymphocytes (CD19) was observed in the deceased with HIV/AIDS. This figure is 27.1±1.5% and 0.11±0.02x10^6 /l) compared to the control group (12.2±2.9% and 0.21±0.05x10^6 /l), $p<0.01$. In the group with combined pathology, B-cell indices are 28.2±1.8% and 0.09±0.03x10^6 /l. In deceased women with AIDS, the content of immunoglobulin A (3.9±0.3 g/l) and IgG (27.3±3.1) is twice higher than in the control group, respectively (1.78±0.04 g/l, 13.8±2.3 g/l), $p<0.01$, Table 2. The amount of IgM in women with AIDS (1.8±0.07 g/l) is also statistically significantly higher than in the control group (1.2±0.05 g/l), but not as pronounced as the levels of immunoglobulins A and G. In the group with combined pathology (AIDS and alcohol dependence syndrome), immunoglobulin levels are also significantly higher than in the control group and higher than in the group of deceased women with alcohol dependence syndrome, Table 2. Thus, a significant decrease in the absolute number of CD4-T helper cells and CD8 cytotoxic T-lymphocytes, accompanied by hyperproduction of IgG and IgA in deceased women with combined pathology (AIDS and alcohol dependence syndrome), can be treated as evidence of a redistribution of the cellular immune response to the humoral response, which is unable to provide protection against HIV/AIDS and opportunistic infections.

Chronic alcohol intoxication leads to a change in the functional state of almost all neurotransmitter systems of the body and is accompanied by serious disorders of neuroimmune interactions, which is expressed not only in an increase in the number of immunoglobulins of all classes, but also in the production of anti-inflammatory and proinflammatory cytokines. IL-10 production increases already at the stage of episodic alcohol consumption, as well as intracellular synthesis of IL-6. The content of proinflammatory – IL-6 (7.5±1.4 pg/ml) and anti-inflammatory – IL-10 (9.9±2.1 pg/ml) cytokines in the serum of the deceased with alcohol dependence syndrome was statistically significantly different from the control group (3.7±0.11 pg/ml and 6.4±0.13 pg/ml).

In deceased women with HIV/AIDS, the content of IL-6 was 28.5±6.2 pg/ml, and IL-10 – 10.7±1.4 pg/ml. High levels of IL-6 indicate a weakening of the functional activity of type I T-helper cells. Elevated levels of IL-6 affect the regulatory disorganization of the immune system, which reduces the differentiation and activity of cytotoxic T lymphocytes and their participation in antiviral and antibacterial immunity. The data obtained on cytokine dysregulation showed that increased levels of IL-6 and IL-10 affect the regulatory disorganization of the immune system and may affect the differentiation and activity of cytotoxic T-lymphocytes and their participation in antiviral and antibacterial immunity. In the pathogenesis of HIV infection and AIDS, cytokine imbalance is central to the pathogenesis and affects the strength of the immune system's response to specific viral antigens. The cytokine network is involved in almost all stages of virus-cell interaction. Imbalance of cytokines contributes to the virus infection of CD4 cells, leading to the progression of immunosuppression and further development of opportunistic infections in patients with HIV, AIDS stage.

Recently, it has been established that adhesion molecules, in particular macrosialin (CD68) and integrin, which can act as coreceptor molecules and interact with ligands of the intercellular adhesion marker (CD54), make a certain contribution to the interaction of viruses with T-lymphocytes, monocytes and macrophages [29]. In patients with AIDS, there is a dysfunction of monocyte cells (in particular, decreased chemotaxis and cytotoxicity).

There is evidence that an increase in the incidence of autoimmune and infectious diseases, and impaired tissue regeneration in alcoholics is a consequence of dysfunction of the immune system. The immune system, as well as the nervous and endocrine systems, is an integrative system and interacts with them normally; in case of pathologies that lead to compensated and uncompensated dysfunctions of these organs, a cascade of secondary trophic disorders occurs and, as a result, a new cycle of organ dysfunctions develops.

Described processes could be detected important link in transformation of inflammatory reaction in different tissue [30-32] and in persons with harmful addiction or genetic predisposition especially [33-35]. But organs of female genital system could be defined as most defined target for such changes in immunity [36,37], where development of neoplastic processes have been characterized especial frequency [38-40]. Our results accords described before changes in cellular and humoral immunity [41,42] in patients with SIDS, that should be taken into account considering unfavorable situation with female health [43], peculiarities of carrying such patients [44] and deontological features [45]. Our data are important for understanding that among women with immunodeficiency and women without immunodeficiency, recurrent loneliness is significantly more common among women with immunodeficiency regarding genital system, and women with immunodeficiency had significantly fewer children [46,47]. Sexual dysfunction, lubrication dysfunction and genital pain dysfunction are significantly more common in women with immunodeficiency compared to women without immunodeficiency; but no differences are seen in menopausal characteristics [46,48].

Thus, the studies have shown that chronic alcohol intoxication leads to statistically significant impairment of cellular immunity in the subjects, namely: impaired proliferative activity of T- and B-lymphocytes; cytolytic activity of natural killer cells. changes in the population composition of blood cells, which is expressed by a decrease in the percentage of CD4 T-lymphocytes (helpers) in the peripheral blood, an increase in CD8 T-lymphocytes and an increase in the percentage of CD19 B-lymphocytes. increase in the peripheral blood of immunoglobulins of all classes, interleukins IL-6 and IL-10.

HIV infection, the AIDS stage, leads to even more serious changes in the state of the immune system: inhibition of T-helper cells, reduction of T-lymphocyte functionality; cytolytic activity of natural killer cells. an increase in the number of B-lymphocytes, impairment of their functional capabilities; a significant increase in the peripheral blood of immunoglobulins of all classes, interleukins IL-6 and IL-10.

Conclusions.

Secondary immunodeficiencies of infectious and non-infectious origin in women (in particular, those formed in HIV infection, alcohol dependence syndrome and their combination) are characterized by negative changes in the cellular and humoral components of the immune system, as evidenced by the presence of transient immunodeficiency, activation of cytolytic and autoaggressive reactions. As a result of these processes, systemic and organ pathology develops, in particular, weakening of the body's resistance to various infections and pathological changes in organs and tissues, which may be one of the links in the development of pathological processes in internal organs and tissues.

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Conflict of interest statement.

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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