N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF BIOLOGICAL AND MEDICAL
ISSN 2224-5308
Volume 1, Number 319 (2017), 22 – 29

UDC 618

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IMMUNOLOGICAL CRITERIA OF PLACENTAL INSUFFICIENCY

Abstract. The studies established the immune system quantitative and functional parameters changes in III trimester of pregnants, women in childbirth, postpartums and newborns with placental insufficiency. The imbalance of lymphocytes subpopulations indicators, increase of early activation and functional cytotoxic activity of immune cells in the systemic and local level were revealed. These changes specify the immunoregulatory mechanisms violations in the mother-placenta-fetus system in case of placental insufficiency and necessity for appropriate correction.

Keywords: placental insufficiency, lymphocytes subpopulation profile, perforin.

A unique relationship between mother and fetus is established during pregnancy. During gestation process, the fetus develops its own immune competence, and the mother's organism with the help of utero-placental complex enhances the effect of adaptation programs that will eventually allow two alien organisms – maternal and fetal to coexist [1]. Participation of the mother's immune system in controlling the gestational process is doubtless, a woman's immune system undergoes significant changes at physiological pregnancy, which are based on the formation of gestational immunosuppression [2, 3].

The condition of the immune system is one of the important criteria of usefulness of functional homeostatic pregnancy mechanisms that ensure a dynamic balance in the mother-placenta-fetus [4]. Pregnancy is characterized by the appearance of fetal antigens that define a particular type of immune response, the population composition of immunecompetent cells and their functional activity. At each stage of gestation there is a certain quantitative level of populations and subpopulations of lymphocytes that reflects a consistent system adaptation to the severity of the antigenic load [5].

As a result of the development of immunological relationship between mother and fetus, the placenta becomes immunologically privileged tissue. Trophoblast also serves as an immunosorbent, connecting antibodies (immunoregulators) and setting the immune camouflage, which blocks efferent link of the immune response. By 10 weeks of pregnancy, the fetus becomes an immunological partner of the mother. This symbiotic relationship leads to the development of immunological imprinting in the mother's organism, which remains for a lifetime. After establishing the immunological symbiosis between mother and fetus, the system becomes extremely resistant to adverse immunologic effects. Hormonal and other events that are programmed at the end of pregnancy, lead to rupture of the immunological symbiosis [6].

The aim of the research is to study the changes in immunological parameters in pregnants, women in childbirth, postpartums and newborns with placental insufficiency.

Material and methods. In order to study the characteristics of homeostasis in the mother-placenta-fetus with placental insufficiency (PI) 2 groups were identified – the main and control groups. The control group consisted of 30 healthy women of childbearing age with physiological pregnancy at 38-41 weeks of pregnancy (III trimester), 30 women in childbirth, 30 postpartums and 30 newborns with Apgar scores of 8-9 points. The main group included women with pregnancies complicated placental insufficiency (III trimester – 30), 30 women in childbirth, 30 postpartums and newborns who underwent intrauterine

PI (30). The material of the research is the peripheral blood of women, as well as the umbilical cord blood of newborns.

Research of subpopulation composition of peripheral blood lymphocytes of women, women in childbirth, postpartums and cord blood detected according to general lymphocytic gate SD45 + by method of direct membrane immunofluorescence on a flow cytometer BD Facs Calibur using a panel of monoclonal antibodies to the surface antigens of lymphocytes: to CD3+ - marker of mature T-lymphocytes, to CD3+, CD4+ - marker of helper-inductor T-cells, to CD3+, CD8+ - marker of suppressor-cytotoxic T-lymphocytes, to CD3+, SD16+ and CD3+, SD56+ - marker of natural killer cells CD16+ and CD56+ phenotypes, to CD19+ - marker of B-lymphocytes, to CD3+, HLA-DR+ - marker of activated T-lymphocytes, to CD3+, CD25+ - marker of £-chain IL-2, to CD3+, CD95+ - marker of apoptosis. IRI was determined by the ratio of CD4+/CD8+ cells, and the apoptosis index according to CD95+/CD25+. The localization of the activation markers CD25+ and CD95+ on the cells was performed by double phenotyping.

Pore-forming protein "perforin" in the cells was determined by permeabilization. We used a commercial reagent kits, labeled FITS (CD3, CD4, CD8, CD16, CD19, CD25, CD95, HLA-DR), and labeled PE (CD25, CD95) BD Biosciences (USA).

Results of the research and their discussion. The criterion for inclusion of pregnant women into the main group was exhibited clinical diagnosis of PI, confirmed by instrumental methods. In order to evaluate the clinical state of pregnant, there was developed a profile, which includes somatic, obstetric, gynecological history, information about gestation course. Also the state of the newborn at birth was taken into account.

Table 1 – Assessment of newborns on Apgar scale

Title	IFS	Assessment on Apgar scale		Birth weight, gr.
		for 1 min.	for 5 min.	
Control group (n=30)	0,84±0,05	7,8±0,17	9,0±0,52	3435,5±286,3
Main group with PI (n=30)	2,35±0,15*	6,7±0,52*	7,5±0,34*	3112,4±222,8
*p <0,001 (related to a control).				

Postnatal adaptation period for all the children in the control group proceeded without peculiarities. The newborns with PI had a significant number of complications. 16.6% of them had a risk of intrauterine infection, malnutrition of I-II degree was observed in 6.6%, 36.6% of newborns had hypoxic genesis CNS, hemolytic disease of the newborn was 3.3%.

During examination of the subpopulation profile of lymphocytes of peripheral blood there was revealed that the immunological parameters in pregnant women with PI were significantly different from the control group (Table 2).

Table 2 – Subpopulation profile of peripheral blood lymphocytes in pregnant women with placental insufficiency (III trimester)

The title of subpopulation of peripheral blood lymphocytes (%)	Pregnancy groups	
	PI (n=30)	Control (n=30)
T-lymphocytes (CD3+ CD19-)	69,01 ± 0,91*	60,91 ± 0,46
T-helpers (CD4+ CD8-)	39,54 ± 040	40,01 ± 0,46
T-cytotoxic (CD8+CD4-)	26,02 ± 0,26	26,34 ± 0,063
NK cells (CD16+CD3+)	19,83 ± 0,49*	10,36 ± 0,19
T-killers (CD56+CD3+)	9,30 ± 0,28*	5,79 ± 0,030
B-lymphocytes (CD19+CD3-)	20,59 ± 0,02*	13,08 ± 0,49
T-activated (CD3+HLA-DR+)	15,42 ± 0,02*	10,76 ± 0,20
B-active. and NK (CD3-HLA-DR+)	22,63 ± 0,020*	12,04 ± 0,20
Early activation marker (CD25+CD3+)	0,45 ± 0,02*	8,0 ± 0,12
Apoptosis marker (CD95+CD3+)	1,29 ± 0,02*	7,21 ± 0,03
Apoptosis index (CD95+/CD25+)	3,02 ± 0,19*	0,90 ± 0,01
IRI (CD4+/CD8+)	1,52 ± 0,01	1,52 ± 0,30
*p<0,05 related to a control.		

This included the significant increase in the number of mature T-(CD3+ SD19-), B-(SD19+ CD3-) lymphocytes, increase in the number of natural killer cells CD16+CD3+ and CD56+CD3+ phenotype, increase in the number of activated CD3+ HLA-DR+ and CD3-HLA-DR+ cells as an indicator of enhancing an immune response to foreign histocompatibility antigens of the second class ($p<0.05$).

At the same time, the decrease in the number of T-lymphocytes bearing a marker of early activation of CD25+ and apoptosis marker CD95+ compared to the control was recorded, which led to an increase in the index of apoptosis CD95+/CD25+ and indicated a violation of proliferation and apoptosis at PI in pregnant women ($p<0,05$). IRI, as well as the number of immunoregulatory inductor-helper (CD4+ CD8-) and cytotoxic (CD8+CD4-) lymphocytes remained almost at the same level with the control.

In the group of women in childbirth(Table 3) with PI, the changes in parameters of the immune system were presented in lower numbers of mature T-(CD3+CD19-), helper (CD4+CD8-) lymphocytes, increase in the number of natural killer cells CD16+CD3+ and CD56+CD3+ phenotypes, increase in the amount of B-cells of antibody producers (CD19+CD3-), CD8+CD4- cytotoxic lymphocytes, increase in the number of activated CD3+HLA-DR+ and CD3-HLA-DR+ cells, decrease in the level of T-lymphocytes carrying early activation markers of CD25+ and Fas-receptor CD95+, mediating apoptosis. The CD95+/CD25+ apoptosis index was lower. These indicators point out the imbalance of immunity in childbirth in the group of women with PI.

Table 3 – Subpopulation profile of peripheral blood lymphocytes in women in childbirth with placental insufficiency

The title of subpopulation of peripheral blood lymphocytes (%)	Pregnancy groups	
	FPI (n=30)	Control (n=30)
T-lymphocytes (CD3+CD19-)	56,84 ± 0,31*	65,3 ± 0,20
T-helpers (CD4+CD8-)	40,89 ± 0,23*	43,17 ± 0,24
T-cytotoxic (CD8+CD4-)	29,40 ± 0,5*	27,2 ± 0,40
NK cells (CD16+CD3+)	22,28 ± 0,51*	11,3 ± 0,02
T-killers (CD56+CD3+)	10,26 ± 0,33*	0,10 ± 0,01
B-lymphocytes (CD19+CD3-)	23,19 ± 0,31*	13,9 ± 0,31
T-activated (CD3+HLA-DR+)	14,5 ± 0,18*	11,38 ± 0,21
B-active. and NK (CD3-HLA-DR+)	22,83 ± 0,33*	13,01 ± 0,10
Early activation marker (CD25+CD3+)	0,80 ± 0,01*	7,74 ± 0,11
Apoptosis marker (CD95+CD3+)	0,90 ± 0,05*	7,51 ± 0,02
Apoptosis index (CD95+/CD25+)	0,83 ± 0,05*	0,97 ± 0,02
IRI (CD4+/CD8+)	1,39 ± 0,02	1,59 ± 0,015
*p<0,05 related to a control.		

In the group of pregnant with PI, examined 3-4 days after birth, in comparison with control data (Table 4) there was detected the reduction in the number of immunoregulatory CD4+CD8+ and CD8+CD4+ lymphocytes numbers, the decrease in the number of CD95+CD3+ cells and no changes in the number of mature CD3+CD19- lymphocytes in the peripheral blood. We tested the increasing number of natural killer cells of both phenotypes, B-cells of antibody producers and their activation according to the HLA-DR+ antigen, the increase in the number of activated CD25+CD3+ lymphocytes and apoptosis index. IRI was significantly lower than in the control group.

Thus, the research of subpopulation composition of peripheral blood lymphocytes of women with PI surveyed during indicated periods (pregnant of III trimester, women in childbirth, postpartums) compared with similar data obtained in women with physiological pregnancy, childbirth and the postpartum period, revealed an imbalance of immune parameters due to the PI.

All groups surveyed for PI, have presented an increase in the number of natural killer cells of CD16+ and CD56+ phenotypes, carrying killing effect; increase in the number of B-cells of antibody producers (CD19+CD3-); increase in the number of T- and B-lymphocytes with HLA-DR+ antigen (pregnants, woman in childbirth) and only B- (postpartums); decrease in the number of cells bearing markers of early

Table 4 – Subpopulation profile of peripheral blood lymphocytes in postpartums with placental insufficiency

The title of subpopulation of peripheral blood lymphocytes (%)	Pregnancy groups	
	FPI (n=30)	Control (n=30)
T-lymphocytes (CD3+CD19-)	66,69 ± 0,66	67,10 ± 0,45
T-helpers (CD4+CD8-)	35,93 ± 0,25*	47,2 ± 1,25
T-cytotoxic (CD8+CD4-)	22,33 ± 0,27*	26,9 ± 1,21
NK cells (CD16+CD3+)	15,93 ± 0,05 *	12,0 ± 0,54
T-killers (CD56+CD3+)	6,67 ± 0,13*	4,13 ± 0,26
B-lymphocytes (CD19+CD3-)	19,02 ± 0,52*	8,3 ± 0,45
T-activated (CD3+HLA-DR+)	9,62 ± 0,13	9,04 ± 0,44
B-active. and NK (CD3-HLA-DR+)	18,72 ± 0,24*	10,3 ± 0,21
Early activation marker (CD25+CD3+)	0,66 ± 0,02*	0,097 ± 0,01
Apoptosis marker (CD95+CD3+)	0,77 ± 0,05*	5,14 ± 0,23
Apoptosis index (CD95+/CD25+)	1,09 ± 0,08*	0,71 ± 0,01
IRI (CD4+/CD8+)	1,62 ± 0,01*	1,75 ± 0,03
*p<0,05 related to a control.		

activation of CD25+ and apoptosis of CD95+ (pregnants, woman in childbirth) and CD95+ (postpartums), increase in the number of cells with CD25+ marker (postpartums); increase in the total number of mature T-lymphocytes (pregnants), decrease in their numbers (woman in childbirth), which does not change in the number (postpartums); no change in the number of immunoregulatory CD4+CD8+ T-lymphocytes in pregnant women, reducing their number in postpartums and nultidirection results in the woman in childbirth group.

Also the main indicators of localization of activation markers CD25+, CD95+ on CD3+, CD4+, CD8+, CD16+, CD56+ lymphocytes of the peripheral blood of pregnant women, women in childbirth, postpartums with PI were investigated. The localization of the activation marker CD25+ on CD3+, CD4+, CD8+, CD16+, CD56+ lymphocytes in pregnants with PI was significantly higher than in the control group of pregnant women. Localization on the cells of Fas receptor CD95+, mediating apoptosis was enhanced in CD3+, CD16+, CD56+ lymphocytes, indicating a willingness of mature T- and natural killer cells CD16+, CD56+ phenotypes to the death and decline on CD4+, CD8+ lymphocytes, which carry immunoregulatory function.

Comparative analysis between the data obtained in the study of the control and main group of cord blood is shown in Tables 5 and 6.

Analysis of lymphocyte subpopulation composition at PI in the maternal part of the umbilical cord blood enabled to establish a significant reduction in the number of mature CD3+CD19-, immunoregulatory CD4+CD8-, CD8+CD4- T-lymphocytes, CD19+CD3-, CD25+CD3 +, with a simultaneous increase in the number of CD16+CD3+, CD56+CD3- lymphocytes. It was noted the absence of differences between the groups of CD3+HLA-DR+, CD3-HLA-DR+, CD95+CD3+ lymphocytes as compared to the control. The apoptotic index at PI was significantly higher.

In other words, there are deviations in the redistribution and migration of lymphocytes of maternal part cord blood, causing quantitative deficiency of mature T-, immunoregulatory, T-helpers and T-suppressor-cytotoxic lymphocytes, B-cells of antibody producers, as well as reducing the number of T-lymphocytes, carrying a marker of early activation of CD25+. Natural killers of CD16+ and CD56+ of phenotypes conversely, were higher than in the controls, and the number of activated T-, B-, NK- cells by HLA-DR markers revealed no significant differences. The fetal part of the umbilical cord blood at PI had change parameters on control different from those in the maternal part. There was a significant increase in the number of CD3+CD19-, CD4+CD8-, CD8+ CD4-, CD16+CD3+, CD56+CD3-, CD19+CD3-, increase in the number of activated T, B, and NK- cells by HLA-DR, reducing the number of CD25+CD3+ and CD95+CD3+ cells, as well as for IRI. The apoptosis index in comparison with the control was the same.

Table 5 – Subpopulation profile of cord blood lymphocytes at placental insufficiency

The title of subpopulation (%)	Cord blood			
	Maternal part		Fetal part	
	Control	PI	Control	PI
T-lymphocytes (CD3+CD19-)	64,26 ± 0,89	55,56 ± 0,82*	48,889 ± 0,06	51,51 ± 1,03*
T-helpers (CD4+CD8-)	37,98 ± 0,15	35,95 ± 0,54*	30,42 ± 0,07	34,99 ± 0,49*
T-cytotoxic (CD8+CD4-)	24,79 ± 0,05	19,71 ± 0,41*	18,2 ± 0,02	22,69 ± 0,22*
NK cells (CD16+CD3+)	10,21 ± 0,01	13,0 ± 0,28*	8,83 ± 0,03	14,0 ± 0,22*
T-killers (CD56+CD3+)	5,1 ± 0,12	5,53 ± 0,13*	3,71 ± 0,04	6,80 ± 0,36*
B-lymphocytes (CD19+CD3-)	15,05 ± 0,48	13,69 ± 0,40*	9,33 ± 0,08	15,04 ± 0,40*
T-activated (CD3+HLA-DR+)	10,45 ± 0,15	10,16 ± 0,42	5,71 ± 0,03	8,49 ± 0,37*
B-activated and NK (CD3-HLA-DR+)	13,99 ± 0,13	13,23 ± 0,50	10,67 ± 0,04	15,06 ± 0,58*
Early activation marker (CD25+CD3+)	2,41 ± 0,009	1,13 ± 0,09*	0,75 ± 0,01	0,54 ± 0,04*
Apoptosis marker (CD95+CD3+)	0,84 ± 0,007	0,81 ± 0,03	1,17 ± 0,09	0,93 ± 0,04*
Apoptosis index (CD95+/CD25+)	0,35 ± 0,004	1,35 ± 0,10*	1,56 ± 0,07	1,72 ± 0,37
IRI (CD4+/CD8+)	1,53 ± 0,003	1,85 ± 0,03*	1,67 ± 0,001	1,55 ± 0,02*
*p<0,05 related to a control.				

In the study of the functional properties of lymphocytes of maternal and fetal parts of the umbilical cord blood at placental insufficiency, changes of the same type were identified. Thus, in contrast to the control group indicators, the localization of CD25+ early activation marker responsible for the processes of cell proliferation, on CD3+CD19-, CD4+CD8-, CD8+CD4-, CD16+CD3+, CD56+CD3+ lymphocytes in maternal and fetal parts at placental insufficiency is increased, which indicates an increase in the proliferative activity of mature T-helper-inductor, suppressor-cytotoxic T-lymphocytes, as well as increasing the functions of natural killer lymphocytes at PI ($p<0.05$).

The localization of CD95+ marker, mediating apoptosis was significantly increased in the lymphocytes of both maternal and fetal parts of umbilical cord blood at PI compared with the control. This concerned the mature T-, suppressor-cytotoxic T-, and natural killer cells CD16+CD56+ phenotypes, indicating a readiness of these cells to die.

Table 6 – Localization of activation markers CD25+, CD95+ on lymphocytes of umbilical cord blood at placental insufficiency

The title of subpopulation (%)	Cord blood			
	Maternal part		Fetal part	
	Control	PI	Control	PI
CD3+ CD19-/CD25+	3,70 ± 0,04	10,0 ± 0,19*	6,43 ± 0,15	11,33 ± 0,58*
CD4+ CD8-/CD25+	3,55 ± 0,05	9,30 ± 0,09*	6,00 ± 0,20	7,90 ± 0,26*
CD8+ CD4-/CD25+	6,15 ± 0,17	11,84 ± 0,23*	7,22 ± 0,002	14,46 ± 0,54*
CD16+ CD3+/CD25+	0,91 ± 0,02	9,38 ± 0,35*	0,70 ± 0,04	9,62 ± 0,56*
CD56+ CD3+/CD25+	0,40 ± 0,05	9,57 ± 0,41*	0,65 ± 0,05	7,47 ± 0,39*
CD3+ CD19-/CD95+	1,55 ± 0,01	9,65 ± 0,27*	3,50 ± 0,07	7,43 ± 0,29*
CD4+ CD8-/CD95+	7,21 ± 0,26	11,63 ± 0,32*	8,95 ± 0,03	6,37 ± 0,39*
CD8+ CD4-/CD95+	5,31 ± 0,37	7,32 ± 0,27*	1,64 ± 0,04	10,05 ± 0,23*
CD16+ CD3+/CD95+	0,13 ± 0,003	6,22 ± 0,22*	0,15 ± 0,004	7,87 ± 0,59*
CD56+ CD3+/CD95+	0,02 ± 0,001	3,81 ± 0,16*	0,05 ± 0,001	6,39 ± 0,30*
*p <0,05.				

The exceptions were CD4+CD8- helper-inductor T-lymphocytes which carry out a protective immune response, their apoptotic processes differ between fetal and maternal cells of umbilical cord blood. In the maternal part, the functions of helper-inductor T on the CD95+ markers were raised, and in the fetal part they were reduced. It is possible that this may be due to the decrease in activity of the functional activity of the pool of cells in maternal part of the umbilical cord control ($p < 0.05$). It was noted the increasing localization CD25+ on CD3+CD19-, CD8+CD4- in fetal part and reduced activation of molecules on CD4+CD8- and CD56+CD3+ lymphocytes as compared to the maternal part, indicating that the diversity of changes in the functional activity of the lymphocytes at PI and its contrast from similar monitoring data ($p<0.05$). All parameters of the immune system, which are responsible for the activation of immune responses when at PI were intended to damage and rejection of the fetus. Identified changes can be regarded as criteria of FGR at PI.

The data obtained in the study of clinical material are presented in Tables 7 and 8. Analysis of the results revealed an increase in both total perforin number, and elevated levels of perforin production by individual cells (CD3+Perf+, CD8+Perf+, CD16+Perf+, CD56+Perf+), significantly higher than similar data identified in physiological pregnancy ($p<0.05$).

Table 7 – The intracellular production of perforin by lymphocytes of the peripheral blood of pregnant women with PI

Title of perforin-positive subpopulation of peripheral blood lymphocytes (%)	Peripheral blood	
	PI	Control
CD3+ Perf+	10,57 ± 0,17*	3,78 ± 0,61
CD4+ Perf+	4,98 ± 0,13*	8,74 ± 0,82
CD8+ Perf+	13,34 ± 0,82*	5,76 ± 0,31
CD16+ Perf+	9,08 ± 0,08*	5,32 ± 0,84
CD56+ Perf+	9,85 ± 0,30*	3,28 ± 0,42
Total perforin number	47,82 ± 0,37*	26,88 ± 0,24
*p<0,05.		

On the system-level at PI, indicators exceeded control data 1.77 times, 2.8, 2.32, 1.71, 3.0 times respectively. This indicates the fact that the level of production by immunocompetent cells of pore-forming proteins that have a cytotoxic effect on target cells increases in the peripheral blood of pregnant women at PI, it may be the basis of pathogenetic mechanisms of PI. The intracellular production of perforin by immunoregulatory CD4+Perf+cells carrying a protective immune response at PI is different from similar control data by reduction 1.76 times ($p<0.05$).

Table 8 – The intracellular production of perforin by lymphocytes of umbilical cord blood of newborns with PI

Title of perforin-positive subpopulation of peripheral blood lymphocytes (%)	Peripheral blood	
	PI	Control
CD3+ Perf+	12,0 ± 0,05*	9,11 ± 0,09
CD4+ Perf+	6,83 ± 0,20*	7,55 ± 0,06
CD8+ Perf+	6,29 ± 0,28*	7,95 ± 0,03
CD16+ Perf+	9,17 ± 0,16*	0,67 ± 0,04
CD56+ Perf+	8,9 ± 0,30*	0,99 ± 0,04
Total perforin number	43,19 ± 0,25*	24,6 ± 0,07
*p<0,05.		

At the local level, in the fetal part of the umbilical cord blood of pregnant women with PI, the total perforin number was as high as in the peripheral blood compared to control data, respectively 1.75 times and at the level of the certain cells among CD3+Perf+- 1.32 times, CD16+Perf+ 13.68 times, CD56+Perf+ - 8.99 times ($p<0.05$), indicating the cytotoxic effect of these cells. The intracellular production of perforin was carried out by mature T- and natural killer cells both phenotypes at the local level.

Immunoregulatory CD4+Rerf+, CD8+Perf+lymphocytes of cord blood at PI was differed from similar control data of reduced production of intracellular perforin ($p<0.05$). These data were less than 1.1 and 1.26 times. In the fetal part of the blood of the umbilical cord at PI, the potent cytotoxic effect on target cells was carried out predominantly by mature T- and natural killer lymphocytes of CD16+, CD56+ of phenotypes compared with the norm.

Conclusions.

1. It was found that the complication of pregnancy with PI violates the adaptation of woman organism, causing severe abnormalities of the immune system in pregnant women, women in childbirth and postpartum, which were evaluated for localization of activation markers of CD25+, CD95+ on CD3+, CD4+, CD8+, CD16+, CD56+ lymphocytes. An increase in the early activation of lymphocytes at the system level (peripheral blood) in pregnants of III trimester, women in childbirth and postpartums with PI, as well as violation of the mechanisms of apoptosis (for CD95+), followed by local breakdowns of immunity. This is reflected in the change of functions of lymphocytes in newborns. The increase of activation (for CD25+), CD3+, CD4+, CD8+, CD16+ CD56+ immune cells, as well as readiness for death (for CD95+) among CD3+, CD4+, CD8+, CD16+, CD56+ lymphocytes of fetal part of the umbilical cord blood was established.

2. At the local level, the unidirectional changes of cord blood lymphoid cell function were observed in the fetal and maternal parts except helper-inductor T-lymphocytes, which have different functions. Subpopulation profile of lymphocytes in the maternal part of cord blood was different from that in the fetal part by decrease in the number of mature T-, immunoregulatory, helper-inductor and cytotoxic T-lymphocytes, by decrease in number of antibody-producing cells, the lack of differences in relation to control activated T-, B- and NK-cells. The number of T-cells with a marker of early activation of CD25+ was equally reduced in both maternal and fetal parts of umbilical cord blood, but the number of natural killer cells CD16+ and CD56+ was equally high in comparison with the control, in both parts of umbilical cord blood.

3. Analysis of the results of the study enabled to reveal that a complication of pregnancy with PI causes profound disturbances in the immune system of women in relation to the functional cytotoxic activity of immune cells, assessed by intracellular production of pore-forming perforin proteins both in systemic and local levels. In contrast to the physiological pregnancy at PI, an increased intracellular synthesis of pore-forming perforin proteins is generated, it is defined by the increase of the total number perforin (peripheral and cord blood), increased intracellular production of perforin mature T-lymphocytes, natural killer cells of both phenotypes (peripheral and cord blood), and suppressor-cytotoxic CD8+ lymphocytes (peripheral blood), which carry the cytotoxic effect of the target cells.

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ПЛАЦЕНТАРЛЫ ЖЕТКІЛІКСІЗДІК ИММУНОЛОГИЯЛЫҚ КРИТЕРИЙЛЕРІ

Аннотация. Зерттеулер плацентарлы жеткіліксіздігі бар босану және жаңа туған нәрестелердің жүкті III триместр, жүкті әйелдер, әйелдер иммундық жүйенің сандық және функционалдық параметрлердің өзгеру сипаты белгіленеді. лимфоциттердің анықталған теңгерімсіздік көрсеткіштері суб, ерте активтендіру және жүйелі және жергілікті деңгейде иммундық жасушалардың функционалдық цитоуытты қызметінің артуы.

Бұл өзгерістер плацентарлы жеткіліксіздік және керекті түзету қажеттілігіне ана-плацента-ұрық иммундық механизмдерін бұзу көрсетуі.

Түйін сөздер: плацентарлы жеткіліксіздік, лимфоциттердің профиль, перфорин.

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ИММУНОЛОГИЧЕСКИЕ КРИТЕРИИ ПЛАЦЕНТАРНОЙ НЕДОСТАТОЧНОСТИ

Аннотация. В результате проведенных исследований установлен характер изменений количественных и функциональных параметров иммунной системы у беременных III триместра, рожениц, родильниц и новорожденных при плацентарной недостаточности. Выявлена разбалансировка показателей субпопуляционного состава лимфоцитов, увеличение ранней активации и функциональной цитотоксической активности иммунокомпетентных клеток на системном и локальном уровне. Полученные изменения указывают на нарушение иммунорегуляторных механизмов в системе мать-плацента-плод при плацентарной недостаточности и необходимости проведения соответствующей коррекции.

Ключевые слова: плацентарная недостаточность, субпопуляционный профиль лимфоцитов, перфорин.

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