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Some state of humoral Immunity in Children With newly diagnosed pulmonary tuberculosis

Key words: *tuberculosis, children, humoral immunity.*

Tuberculosis (TB) is one of the most common infectious diseases in the world. Ukraine, according to experts WHO, among the countries of the European region has a high incidence of disesase. In recent years, there has been a downward trend in the prevalence of TB. An important role in this process plays the modern diagnosis of the disease and the studying in-depth of pathogenetic features of TB [9]. Children are the most vulnerable category of the population of TB disease [3] due to the social and anatomical and physiological factors, in particular, due to the nature of the immune system of children. Contact the causative agent of TB microorganism is accompanied by development of tuberculous granulomas. In the process of its formation are recruited considerable number of cells and mediators of immune inflammation [1].

The ontogeny of immune inflammation begins with its nonspecific phase, playing mostly preparatory role (phthisis incipience – by definition NIJ-old authors) and ends at a specific phase of the cell response (phthisis conformata) [6, 8]. Both phases of the immune response are closely interacted with each other. Children with local forms of newly diagnosed pulmonary TB (NDTB) revealed violations in the form of dysfunction of phagocytic cells and increase in proliferative activity of lymphocytes in their reaction of blasttransformation with BCG [4] that alters the activity of the humoral immune component [10, 11]. The activity of nonspecific and specific humoral immune response to TB infection may play an important role in the diagnosis of disease, response to therapy, as well as in the choice of directions of rational immunomodulation [7].

Purpose – to examine the state of some indicators of specific and nonspecific components of humoral immunity of children with newly diagnosed pulmonary TB.

Research included in the plan of scientific research, conducted for the state budget funds.

Material and methods

Research subject to 44 children between the ages of 6 to 16 years with a diagnosis of newly diagnosed TB (NDTB), which addressed the NIFP NAMSU for 2012–2014 for the diagnosis and treatment of TB. For general clinical examination of children used methods: collection of complaints and anamnesis of illness and life; Physical methods, radiographic and clinical laboratory methods. All the children in the survey response to the Mantoux test of 2 TE was positive. The tuberculin sensitivity in all investigated was evaluated as an infectious allergy, when X-ray study was diagnosed NDTB. The specific nature of the process was confirmed by the positive reaction to the test with the allergen recombinant tuberculosis (ART) for all the children. In this group children by age as follows: 6 to 9 years – 20 children (45,6 ± 7,5) %, from 10 to 14 years – 12 (27,2 ± 6,7) %, adolescents (15–16 years) – and 12 (27,2 ± 6,7) %.

Control group consisted of 44 healthy, vaccinated with BCG, children 6–16 years old, are not infected with TB mycobacteria (MTB). These children are treated at the SE «NIFP NAMSU» for 2012–2014 years to clarify the nature of tuberculin sensitivity. After careful examination, the results of the analysis of the dynamics of Mantoux test, the sample with the ART, studying epidemiological anamnesis, examination of family members for TB, TB and organ infection in these children, the MTB infection has been excluded. In the group of healthy children test with the ART was negative.

To study the state of humoral immunity of children with local NDTB forms at different ages children NDTB (main group) and control group were divided into age groups – 6–9 and 10–16 years. In the age group of 6–9 years were 20 sick children and in the appropriate control group – 26 healthy children of the same age and sex. Local forms NDTB aged 10-16 years were diagnosed in 24 children and

Table 1

The content of some indicators of humoral immunity in the blood of children of 6–9 years with the local tuberculosis (M ± m)

Indicators	Group of children	
	Children NDTB (n = 20)	Control (n = 26)
Immunoglobulin A, g/l	1,3 ± 0,2	1,7 ± 0,2
Immunoglobulin M, g/l	1,9 ± 0,2	1,6 ± 0,3
Immunoglobulin G, g/l	11,8 ± 1,0	10,9 ± 1,2
Immunoglobulin E, IU/ml	245,6 ± 81,2*	68,0 ± 32,7
The level of anti-TB antibodies (USD)	0,52 ± 0,11*	0,11 ± 0,03
The level of the CIC average molecular mass (USD)	59,2 ± 9,9	39,0 ± 4,4
The level of low molecular mass CIC (USD)	389,0 ± 63,7*	635,9 ± 75,8

Note: * The difference in the index compared with the control group statistically significant ($p < 0,05$).

in the control group of the same age were included 18 children. To characterize the humoral immunity were studied in serum immunoglobulins (Ig) class A, M, G, E by enzyme linked immunosorbent assay (ELISA) using test systems HEMA-MEDIKA (Moscow, Russia) with the calculation results on the analyzer, spectrophotometer μQuant (BioTek, USA) with a measuring range: 200–999 nm (± 1 %). The concentration of circulating immune complexes (CIC) was determined by precipitation with polyethylene glycol test systems HEMA-MEDIKA (Moscow, Russia) on the analyzer, spectrophotometer μQuant (BioTek, USA). To estimate the total content of anti-TB antibodies (classes IgA, IgG, IgM) in the serum ELISA method was used to test the system, AT-Tub-Best Strip (Vector-Best, Russia).

Statistical data processing was carried out using licensed software package Microsoft Office Professional 2003 License Russian Academic OPEN No Level № 17016297. To check compliance with the distributions of series of measurements used normal distribution function NORMSAMP-1 in Microsoft Excel, on the basis of which the selected parameter (t-Student test reliability) or nonparametric (Wilcoxon test), statistical methods [5] to estimate the reliability of the research results for a given significance level of $p \leq 0,05$.

Results and discussion

A survey of children aged 6–9 years and control group had changes of some indicators of humoral immunity, are shown in Table 1.

It should be noted that the average content of Ig A, M, G in children younger WHO-age group with NDTB did not differ from healthy children, which can relatively indicate some inconsistency non-specific immune protection of patients in this age group that along with the detection of changes in cellular immunity of such children may be a indicator for the predisposition of secondary immune deficiency formation [4]. At the same time index of serum IgE in children 6–9 years with NDTB (245,6 ± 81,2) IU/ml, exceeding the rate of 3.6 times ($p < 0,05$).

The average level of anti-TB-antibodies in the serum of young children with TB equal (0,52 ± 0,11) USD, 4.7 times ($p < 0,05$) was significantly higher than those in the control group (0,11 ± 0.03) USD.

The content of the CIC average molecular mass in children of the main group was at the level (59,2 ± 9,9) USD and it did not significantly differ from the same in the control group (39,0 ± 4,4) USD. Outside CIC low molecular weight in the main group of children 6-9 years old was (389 ± 63,7) USD, which was 1.6 times significantly ($p < 0,05$) less than in the control group (635, 9 ± 75,8) USD.

We examined children in the target group aged 10–16 years, along with indicators of serum IgA and IgM, the content of which is not different from control values, there was a significant increase in the level of IgG in the serum of 1.4 times ($p < 0,05$) compared with healthy (Table. 2).

The value of IgE in the study group with older children NDTB equal (143,4 ± 32,9) IU/mL and were not significantly different from that in the control group (115,1 ± 52,3) IU/ml. The level of anti-TB antibodies in the older age group of children with NDTB reached (0,3 ± 0,04) USD, significantly higher than the 3.7 times ($p < 0,05$) that in the control group (0,082 ± 0,010) at. o., which can be considered as a voltage of a specific immune response.

Despite the tension of specific immunity, studies characteristics of the immune response in tuberculosis was observed the development of secondary immune deficiency, in which the use of immunoreactive preparation increased the efficiency of complex treatment of tuberculosis [7].

CIC values of average molecular mass in the blood of NDTB children aged 10–16 years were (60,6 ± 10,9) USD and 2.1-fold ($p < 0,05$) was significantly higher than

Table 2

The content of some indicators of humoral immunity in the blood of children 10–16 years with a local tuberculosis (M ± m)

Indicators	Group of children	
	Children NDTB (n = 20)	Children NDTB (n = 20)
Immunoglobulin A, g/l	1,9 ± 0,2	1,9 ± 0,2
Immunoglobulin M, g/l	1,8 ± 0,2	1,3 ± 0,2
Immunoglobulin G, g/l	17,7 ± 1,0*	12,8 ± 1,7
Immunoglobulin E, IU/ml	143,4 ± 32,9	115,1 ± 52,3
The level of anti-TB antibodies (USD)	0,3 ± 0,04*	0,08 ± 0,01
The level of the CIC average molecular mass (USD)	60,6 ± 10,9*	28,2 ± 5,1
The level of low molecular mass CIC (USD)	409,6 ± 49,7*	614,7 ± 66,1

Note: * The difference in the index compared with the control group statistically significant ($p < 0,05$).

those in the corresponding control group (28,2 ± 5,1) USD. At the same time, the contents of the CIC average molecular mass was elevated compared to control values in a 2.1-fold ($p < 0,05$). The level of low molecular mass CIC in patients older children equal (409,6 ± 49 7) USD, which was 1.5 times ($p < 0,05$) was significantly less than in the control group of children of the same age (614,7 ± 66,1) UO.

Thus, changes in humoral immunity in children with NDTB age group 6-9 years were characterized by increased content of immunoglobulin E, voltage specific immunity with increased levels of anti-TB antibodies and decreased content of CIC low molecular mass. A feature of the humoral immune response of children aged 10–16 years were non-specific immune response voltage due to the enhance levels of serum IgG and specific – with a high content of anti-TB antibodies and the CIC average molecular mass as well as reducing the CIC noted low molecular mass. These changes create preconditions for efficient immune find ways to improve the effectiveness of specific anti-TB therapy.

Conclusions

1. In the blood of children with newly diagnosed tuberculosis local age group 6–9 years was an increase in the content of IgE, specific immunity voltage with increasing levels of anti-TB-antibodies and the decrease in the concentration of the CIC of low molecular mass with unexpressed non-specific immune response.

2. In children aged 10–16 years humoral immune response characterized by non-specific immune response voltage to the enhance levels of serum immunoglobulin G, CIC moderate molecular mass and a specific - with a high level of anti-TB-antibodies. The level of CIC low molecular mass was reduced.

3. Revealed changes create preconditions for rational immunomodulation, which may increase the effectiveness of the specific treatment of tuberculosis.

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СОСТОЯНИЕ ПОКАЗАТЕЛЕЙ ГУМОРАЛЬНОГО ИММУНИТЕТА У ДЕТЕЙ С ВПЕРВЫЕ ВЫЯВЛЕННЫМ ТУБЕРКУЛЕЗОМ ЛЕГКИХ

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Резюме

Туберкулез (ТБ) – одно из самых распространенных инфекционных заболеваний человека. Дети – наиболее уязвимая часть населения по заболеванию ТБ из-за анатомо-физиологических особенностей детского организма. В его возникновении и развитии важную роль играет состояние иммунной системы ребенка, в частности ее гуморальной составляющей.

Цель работы *– изучить состояние некоторых показателей гуморального иммунитета детей с локальным ТБ.*

Материалы и методы. *Исследовали 44 ребенка в возрасте 6–16 лет с диагнозом впервые диагностированного туберкулеза (ВДТБ). Наряду с общеклиническими физикальными и лабораторными методами у детей исследовали содержание в крови иммуноглобулинов (Ig) A, M, G, E, уровень противотуберкулезных антител и циркулирующих иммунных комплексов (ЦИК) малой и средней молекулярной массы.*

Результаты. *У детей с ВДТБ в возрасте 6–9 лет отмечалось повышение содержания IgE, напряжение специфического иммунитета с повышением уровня противотуберкулезных антител и снижением содержания ЦИК малой молекулярной массы. У детей 10–16 лет отмечено напряжение неспецифического иммунного ответа с повышенным уровнем сывороточного IgG и специфического – с повышенным уровнем противотуберкулезных антител и ЦИК средней молекулярной массы, а также снижение уровня ЦИК малой молекулярной массы.*

Выводы. *Указанные изменения создают предпосылки для поиска путей рациональной иммунокоррекции с целью повышения эффективности проводимой специфической противотуберкулезной терапии.*

Ключевые слова: *туберкулез, дети, гуморальный иммунитет.*

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СТАН ПОКАЗНИКІВ ГУМОРАЛЬНОГО ІМУНІТЕТУ У ДІТЕЙ ІЗ ВПЕРШЕ ВИЯВЛЕНИМ ТУБЕРКУЛЬОЗОМ ЛЕГЕНЬ

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Резюме

Туберкульоз (ТБ) – одне з найпоширеніших інфекційних захворювань людини. Діти – найбільш уразлива частина населення по захворюванню на ТБ через анатомо-фізіологічні особливості дитячого організму. У виникненні й розвитку ТБ важливу роль відіграє стан імунної системи дитини, зокрема її гуморальної складової.

Мета роботи: *вивчити стан деяких показників гуморального імунітету дітей з локальним ТБ.*

Матеріали та методи дослідження. *Досліджували 44 дитини у віці 6–16 років із діагнозом уперше діагностованого ТБ (ВДТБ). Поряд із загальноклінічними фізикальними й лабораторними методами у дітей досліджували вміст у крові імуноглобулінів (Ig) A, M, G, E, рівень протитуберкульозних антитіл і циркулюючих імунних комплексів (ЦІК) малої й середньої молекулярної маси.*

Результати. *У дітей із ВДТБ у віці 6–9 років відзначалося підвищення вмісту IgE, напруга специфічного імунітету з підвищенням рівня протитуберкульозних антитіл і зниженням вмісту ЦІК малої молекулярної маси. У дітей 10–16 років відзначена напруга неспецифічної імунної відповіді з підвищеним рівнем сироваткового IgG і специфічної – з підвищеним рівнем протитуберкульозних антитіл і ЦІК середньої молекулярної маси, а також зниження рівня ЦІК малої молекулярної маси.*

Висновки. *Зазначені зміни створюють передумови для пошуку шляхів раціональної імунокорекції з метою підвищення ефективності проведення специфічної протитуберкульозної терапії.*

Ключові слова: *туберкульоз, діти, гуморальний імунітет.*

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