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NEW APPROACHES TO INCREASING THE EFFECTIVENESS OF VACCINATION WITH TYPHOID VACCINES IN MEDICINE AND SPORTS

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Abstract. Typhoid fever, caused by a variety of bacteria, remains a serious public health problem, especially in regions with poor sanitation and limited access to clean water. One of the key strategies for the prevention of typhoid fever is the implementation of effective immunoprophylaxis measures. Vaccine prevention is recognized throughout the world as a decisive factor in reducing the incidence of infectious diseases, mitigating the severity of clinical symptoms and reducing mortality rates. About 343 people were examined in the work. All examined were males aged 18-22 years. To conduct the research, we used Vaccination with a chemical sorbed liquid typhoid vaccine produced by Uzbiopharm OJSC. Vaccination with dry alcoholic typhoid vaccine produced in the Russian Federation (series No. 23-2, K 23, R 94.161.387). Based on the results, it was concluded that the immunological effectiveness of the typhoid vaccine VBTHSJ OJSC "Uzbiofarm" was 66.66%, and the vaccine BTVSS RF - 74.58%. Immunomodulin contributed to an increase in the effectiveness of the VBTHSJ vaccine of Uzbiopharm OJSC from 66.66% to 95.17%.
Key words: immunological vaccine, typhoid vaccine, immunobiological, immunomodulin.

Introduction. A characteristic feature of modern infectious pathology is the growth of chronic forms of infectious and inflammatory diseases of various etiologies. As a rule, these diseases are caused by microorganisms with atypical, constantly changing biological properties and multiple antibiotic resistance [1; 2]. The tension of the epidemic situation regarding intestinal infections in the countries of Central Asia is facilitated by the immediate proximity to Afghanistan, where there is almost no control over these diseases. This indicates the need to increase the effectiveness of the fight against these infections, continuous improvement and expansion of measures aimed at reducing morbidity [2; 3; 4]. In this regard, evolutionary changes in the nature of the infectious process in typhoid fever are no exception. Typhoid fever is widespread throughout the world and accounts for about 12.5 million cases per year with a mortality rate of about 1%. The disease is common mainly in developing countries, and, as a rule, there is a certain pattern between the standard of living and the incidence of typhoid fever. The insufficient effectiveness of measures to combat typhoid fever, taken both within the framework of national and international programs, encourages the search for new approaches to analyzing the situation and establishing patterns of evolutionary variability of typhoid fever, critically rethinking a number of theoretical principles at the level of modern knowledge and using modern methodological techniques [5; 6; 7; 8; 9; 10; 11; 12]. One of the methods for preventing the incidence of typhoid fever is the development of effective measures of specific immunoprophylaxis. Vaccine prevention is a globally recognized leading factor in reducing infectious morbidity, reducing the severity of the clinical course and reducing mortality [13; 14; 15; 16]. The conjugate vaccine derived

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from Salmonella typhi-Vi (Vi-rEPA) has reduced the incidence of typhoid fever in children 2-4 years of age by more than 90%. For a vaccine eradication program to be successful, four conditions must be met: the infection must only affect humans and there must be no reservoir in animals; in the case of viral infections, there must be a minimum number of different strains, combined with the stability of antigenic properties; the microorganism should not persist in the affected organism; an effective vaccine must be available [17; 18]. The effectiveness of vaccination does not always depend on the quality of the vaccine used; factors such as antigenic differences between circulating strains of S. typhi, immunogenetic characteristics and the immunoreactivity of the body of those vaccinated also play a role here. The immunological activity of vaccines may reflect its preventive effectiveness if the protective level of immunological indicators for a given infection is known [19; 20; 21; 22].

An objective assessment of the immunological effectiveness of vaccines can be obtained by studying the degree of antibody formation in humans after vaccination. The assessment of the immunogenicity of the vaccine preparation is carried out on the basis of determining the ratio of the number of persons classified after vaccination into the seropositive and seronegative groups [20; 23]. In such cases, the effectiveness of drugs is often assessed by the increase in the titer of specific antibodies before and after vaccination. Immunological changes that occur during vaccination are also assessed by the percentage of seroconversion. The vaccine is considered highly effective if the seroconversion rate is 90% or higher. In addition, the duration of preservation of post-vaccination protective immunity is of no small importance [19; 20; 23].

Socially and economically justified today is the optimization of the process of vaccine prevention of typhoid fever with the introduction of appropriate adjustments both in the process of vaccine selection and in the processes of immunogenesis in the body. This, in turn, requires identifying the reasons for the unsatisfactory effectiveness of vaccination, developing approaches to predict and improve the efficiency of the vaccination process against typhoid fever [24; 21; 25; 26; 26; 27].

Purpose of the study: to identify the relationship between the severity of the immunological effectiveness of typhoid vaccines and the effect of the immunomodulator Immunomodulin.

Material and research methods.

Nature and scope of research conducted

We examined 343 people. All examined were males aged 18-22 years. The following methodological approaches were used to conduct the research:

1. Vaccination with chemical sorbed liquid typhoid vaccine produced by Uzbiopharm OJSC.
2. Vaccination with typhoid fever alcohol dry vaccine produced in the Russian Federation (series No. 23-2, K 23, R 94.161.387).
3. Serological - determination in the blood of the titer of specific antibodies to the Salmonella O-antigen in the passive hemagglutination reaction (RPHA).
4. Immunocorrection with Immunomodulin during vaccination with a chemical sorbed liquid typhoid vaccine produced by Uzbiopharm OJSC.
5. Methods of statistical processing.

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In this work we have identified the following objects of research:

1. Dry alcoholic typhoid vaccine produced in the Russian Federation (series No. 23-2, K 23, R 94.161.387). The drug is typhoid bacteria inactivated by ethyl alcohol and contains 5 billion typhoid microbial cells in one dose.

Immunobiological properties. A double dose of the drug provides protection for 65% of those vaccinated against typhoid fever for 2 years. Purpose. Prevention of typhoid fever in adults (men up to 60 years old, women up to 55 years old).

Directions for use and dosage: Vaccination was carried out 1 time with a dose of 1.0 ml. The drug was injected with a syringe subcutaneously into the subscapular region. Immediately before vaccination, 5 ml of an isotonic sodium chloride solution was added to the ampoule with typhoid vaccine. The contents of the ampoule were mixed. The dissolution time did not exceed 1 min. The dissolved drug was a homogeneous cloudy suspension with a grayish or yellowish tint, without flakes or foreign inclusions. The resuspended vaccine was stored in compliance with aseptic rules and used within 2 hours. The opening of the ampoules and the vaccination procedure were carried out in strict compliance with the rules of asepsis and antiseptics.

2. Typhoid fever chemical sorbed liquid vaccine OJSC "UZBIOPHARM" (series No. 020802 and No. 011003, K 409): Composition: 1 ml contains 0.2 mg of typhoid antigen, obtained by enzymatic digestion of typhoid microbial cells with pancreatin, concentrated with ethanol in the cold and adsorbed on aluminum hydroxide. It has the appearance of a cloudy white liquid with a yellowish tint; when standing, it forms an amorphous sediment that easily breaks up when shaken; the preservative is merthiolate. Immunobiological properties: The vaccine stimulates the formation of specific antibodies in the blood that lyse typhoid bacteria. With a single application, it provides protection against the disease for 6-9 months. Purpose: Prevention of typhoid fever in persons aged 15 to 55 years.

Method of administration and dosage: Vaccination is carried out once in a dose of 1 ml. In areas with a high incidence rate, repeated vaccination is allowed (according to epidemiological indications) with the same dose, but not earlier than 6 months after the previous vaccination. The drug is administered subcutaneously with a syringe into the subscapular area. Due to the presence of a sorbent in the vaccine, bottles or ampoules with the vaccine must be shaken before each use. The opening of a bottle or ampoule and the vaccination procedure are carried out under strict control and aseptic technique. Do not remove the entire cap and rubber stopper. The vaccine is stored in an opened vial or ampoule for no more than 30 minutes.

3. Immunomodulin - consists of a complex of low molecular weight natural thymic peptides or their analogues (100 mcg/ml, sodium chloride 0.009 g, water for injection 1 ml). Series No. 270205 K No. 199. Pharmacological and pharmacodynamic properties. Immunomodulin corrects impaired functions of the immune system in humans and animals. In case of immunodeficiencies and autoimmune processes, it restores the content of T-lymphocytes, T-suppressors, T-helpers, phagocytes in the blood and reduces the intensity of immune reactions directed against one’s own organs and tissues, stimulates the immune response against infectious agents (viruses, fungi, bacteria, parasites), detoxification processes in the liver, as well as regeneration of body tissues. Enhances interferon production. Increases the effectiveness of vaccination in children and adults, eliminates HBs antigen from

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the blood of patients with viral hepatitis. It has biostimulating and hemostimulating properties. Slows down the aging process.

The clinical effectiveness of Immunomodulin is manifested in an improvement in the condition, a more rapid disappearance of the main symptoms of the disease - pain, dyspeptic symptoms, intoxication, a sharp acceleration in the time of scarring of ulcers and a decrease in the size of the liver, a reduction in recovery time and a decrease in the frequency of relapses of diseases. Interaction with other drugs. The drug is compatible with antibiotics and other basic therapy drugs. Indications for use. Immunomodulin is used to stimulate, correct and prevent disorders of the immune system in immunodeficiency conditions, including in patients with viral hepatitis, collagenosis (rheumatism, rheumatoid arthritis, systemic scleroderma), purulent-septic diseases (destructive pneumonia, osteomyelitis, erysipelas), chronic bronchitis and pneumonia, pyelonephritis, diabetes mellitus, gastroduodenitis, duodenal ulcer, skin and venereal diseases, during chemotherapy and radiation therapy of tumors, as well as in those living and working in environmentally hazardous conditions, vaccinated, etc.).

Method of administration and dose. It is recommended to prescribe immunomodulin against the background of basic therapy for children and adults in courses of 7-10 injections, one injection daily at a daily dose of 1.0-1.5 mcg/kg body weight subcutaneously or intramuscularly. For children, the drug is administered based on body weight: up to 10 kg - 0.1 ml; 10-30 kg - 0.3 ml; 30-50 kg - 0.5 ml; from 50 kg and above, 1.0 ml for chronic diseases, an additional maintenance course of 1-3 injections is carried out weekly (10-16 weeks).

4. Peripheral blood serum of vaccinated individuals.

All volunteers were examined comprehensively using serological methods in the dynamics of the vaccination process: serological reaction indicators (SRGA) with the O-antigen and Vi-antigen of Salmonella typhi were studied before vaccination and on the 30th day after vaccination.

To diagnose RPHA, we used commercial diagnostic kits:

Diagnosticum erythrocyte Salmonella O-antigen, liquid 1, 9, 12, series No. 5 to No. 524, 4 ampoules of 20 ml; 1% suspension of unsensitized formalinized sheep erythrocytes (control erythrocytes) 1 ampoule of 20 ml; Salmonella diagnostic serum O group D (for control in RPGA) series No. 3, to No. 442, valid until 10-2008 1 ampoule (1 ml). License No. 64/802/99 dated April 20, 1999, FS 42-3408-97. Ministry of Health of the Russian Federation.

Diagnosticum erythrocyte salmonella O - antigenic liquid is a 0.75% suspension of formalinized and sensitized O-antigen S. typhi human erythrocytes of blood group 0(1) in a phosphate buffer solution. Preservative - formaldehyde. Diagnosticum is a homogeneous brown suspension. During storage, red blood cells settle, the supernatant remains clear, colorless or slightly yellowish.

Biological properties: The active principle of diagnosticums is the Vi- or O-antigen, fixed on the surface of erythrocytes. When interacting with sera containing antibodies to the B or O antigen, the phenomenon of erythrocyte agglutination (RPGA) is observed.

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Purpose. Diagnosticums erythrocyte Salmonella B- or O-antigen liquid are intended for detection in human blood serum of antibodies to the corresponding Salmonella typhus antigens in a passive hemagglutination reaction (RPHA).

To solve the tasks set for the study and achieve the goal, an analysis of serological data was carried out on volunteers, some of whom were vaccinated with only one of the compared typhoid vaccines, the other part received Immunomodulin simultaneously with the vaccine.

The nature and scope of the studies conducted are shown in Table 1.

Nature and scope of research conducted

Table 1.

Laboratory / Indicators / Objects research	NST test		RPGA	
	before vaccination		before vaccination	on the 30th day after vaccination
	in vivo		O-ag	O-ag
Dry alcoholic typhoid vaccine produced in the Russian Federation	181		181	181
Chemical sorbed liquid typhoid vaccine OJSC “Uzbiopharm”	99		99	99
Chemical sorbed liquid typhoid vaccine OJSC “Uzbiopharm” + Immunomodulin	63		63	63

Blood in the amount of 5-6 ml was taken from the cubital vein in the morning on an empty stomach into tubes with heparin and saline.

The hemagglutination reaction is based on the ability of red blood cells to stick together when certain antigens are adsorbed on them. The indirect hemagglutination reaction (passive hemagglutination) occurs when immune serum corresponding to the antigen is added to red blood cells sensitized with an antigen, i.e., carrying an adsorbed antigen.

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This test is often superior in sensitivity and specificity to other serological methods and is used for infections caused by bacteria and rickettsiae [23].

For serological testing, blood was taken on an empty stomach (to avoid chylability, i.e., turbidity of the serum) from the cubital vein. When drawing blood, the rules of asepsis were observed. Blood in an amount of 5-6 ml was taken into a sterile centrifuge tube, which immediately after collection was placed in a thermostat at 37°C for 1/2-1 hour. The resulting blood clot was separated from the walls with a sterile glass rod or Pasteur pipette, and then left for 18-20 hours in a cool place (4-10°C). The settled serum was poured into another sterile test tube over the edge, or better, using a Pasteur pipette with a rubber balloon. When an admixture of erythrocytes entered the serum, it was centrifuged and again drained from the sediment. Serum can remain on the clot for no more than 48 hours after blood collection; Pure serum (without admixture of red blood cells) was stored under sterile conditions at a temperature of 4-10°C for up to 1 month. If it was necessary to preserve the serum for up to 2-3 months, it was frozen at a temperature of -20 to -70°C and stored without thawing. In each group of subjects, blood was drawn twice: the first time before vaccination and the second time after vaccination on the 30th day. The groups of subjects examined are presented in Table 1.

Before opening, the ampoules were carefully shaken to obtain a homogeneous suspension of red blood cells. Shaking should be repeated as work progresses. The diagnosticum from the opened ampoule can be poured into a sterile bottle with a rubber or ground-in stopper. In this form, the diagnosticum can be stored at a temperature of 4 to 10 ° C for 1 month. Round-bottomed ("U"-shaped) polystyrene plates were used to set up the RPHA. When using each new series of diagnosticum, it is mandatory to perform a RPGA with the accompanying Salmonella "receptor O" serum, liquid. The serum was diluted starting from a 1:5 dilution to double the titer indicated on the ampoule label. Double serial dilutions of the test sera were prepared in a 0.9% sodium chloride solution (pH 7.2) in a volume of 0.05 ml, starting from 1:5 to 1:1280. Add 0.025 ml of diagnosticum to each well with diluted sera.

1. Mandatory controls are:
2. control of serum, which is added in a dilution of 1:5 in a volume of 0.05 ml into two wells;
3. control of the diagnosticum, for which 0.025 ml of diagnosticum is added to 2 wells containing 0.05 ml of 0.9% sodium chloride solution.

The plates were shaken and placed for 2.0 - 2.5 hours in a thermostat at a temperature of 37±1°C. Accounting of results: Accounting of the reaction was carried out using a four-cross system:

++++ - all red blood cells are agglutinated and evenly cover the bottom of the well;

+++ - almost all red blood cells are agglutinated. Against their background, there is an inconspicuous ring of settled, non-agglutinated erythrocytes;

++ - along with uniform agglutinate at the bottom of the well there is a sediment of non-agglutinated erythrocytes in the form of a small "ring" or "button";

+ - most of the red blood cells are not agglutinated and settled in the form of a small "ring" with uneven edges in the center of the bottom of the hole;

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– - there are no signs of agglutination. The red blood cells settled in the form of a small “ring” with smooth edges or a “button” in the center of the bottom of the hole.

A reaction rated at least 3+ is considered positive.

The results obtained in the RPGA can be considered reliable if a positive result is obtained with the supplied serum at a dilution of no less than 1/2 of its titer; there are no flakes or sediment in 2 wells with serum diluted 1:5; in wells with 0.9% sodium chloride solution and O-diagnosticum the reaction is negative.

The antibody titer of the test serum is considered to be the last dilution in which it gives a positive erythrocyte agglutination reaction.

Persons in whose sera antibodies to the O-antigen were detected at a dilution of 1:50 or higher (1:100, 1:200, 1:400, etc.) were considered to have a positive response to the administration of the typhoid vaccine. Thus, a titer of 1:50 was considered diagnostic; a positive result with the somatic O-antigen was taken into account, since a positive reaction with the Vi-antigen has no independent significance in the dynamics of the vaccination process.

Statistical processing of digital material

To establish the reliability of the digital material, the results obtained were statistically processed. The arithmetic mean of the series (M), the error of the arithmetic mean (m), the standard deviation, and confidence limits at a probability of 95% were calculated. The significance of differences was determined according to Student's test [17].

The arithmetic mean M was calculated using the formula:

$$M = \frac{E_x}{n}$$

, where Ex- is the sum of the results of individual determinations;

n- is the total number of definitions. The standard error m was found using the formula:

$$m = \frac{E\,(x_2 - x_1)^2}{n\,(n-1)}$$

, where E (x2 – x1)2 is the sum of squared deviations of the results of individual measurements from the arithmetic mean; n is the number of individual measurements.

Reliability t was determined by the formula:

$$t = \frac{M_1 - M_2}{\sqrt{(m_1^2 + m_2^2)}}$$

,

Where:

M1; M2 – comparative arithmetic averages;

m1, m2 – errors of arithmetic means.

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Data are expressed as mean±SD. Control values between groups were compared by analysis of variance. The Student's *t*-test was used to compare two means. A probability of less than 0.05 was taken as a statistically significant difference. Statistical analysis was performed using OriginPro 7.5 software (OriginLab Co., U.S.A).

Results and its discussion.

The objective of this study was a comparative assessment immunological effectiveness of typhoid vaccines VBTHSJ JSC "UZBIOPHARM" and VBTSS RF.

The immunological effectiveness of the vaccines was assessed by determining the titer of specific antibodies to the S. typhi O-antigen in the blood serum in paired sera obtained before vaccination and on the 30th day after vaccination. According to the order of increasing titer of specific antibodies in paired sera, the vaccinated were divided into the following groups:

0 – group – no increase in the titer of specific antibodies (no immune response);

Group 1 – increase in the titer of specific antibodies by 1 order of magnitude (absence of immune response);

2nd group - increase in the titer of specific antibodies by 2 orders of magnitude (weak immune response);

3rd group - increase in the titer of specific antibodies by 3 orders of magnitude (moderate immune response);

4th group - increase in the titer of specific antibodies by 4 orders of magnitude (pronounced immune response);

Group 5 - an increase in the titer of specific antibodies by 5 orders of magnitude or more (pronounced immune response).

Research results.

Immunological effectiveness of vaccines VBTHSJ OJSC "UZBIOPHARM" and VBTSS RF

A controlled epidemiological experiment was conducted on 99 male volunteers aged 18-22 years during routine vaccination with VBTHSJ of OJSC "UZBIOPHARM". The research results allowed us to state that after vaccination with VBTHSJ produced by OJSC "UZBIOPHARM" out of 99 people, the 0th (seronegative) group with no increase in antibody titer consisted of 9 (9.09%) individuals, the 1st (seronegative) group - 24 (24 ,24%) persons,

2nd (weakly seropositive) group - 26 (26.26%) people, 3rd (sero-positive) group - 31 (31.31%) people, 4th (strongly seropositive) group - 5 (5, 05%) individuals and the 5th (pronounced seropositive) group consisted of 4 (4.04%) individuals. That is, after vaccination with VBTHSJ produced by OJSC UZBIOPHARM, the group of people with no or very low immune response (seronegative) to the effects of the vaccine antigen consisted of 33 (33.33%) vaccinated people. And the group of people with the formation of protective titers (2nd, 3rd, 4th and 5th groups) - with various manifestations of a significant immune response - consisted of 66 (66.66%) people. Of the total number of subjects, the group of people with a pronounced immune

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response to the influence of the vaccine antigen (groups 4 and 5) consisted of 9 (9.09%) vaccinated people (Table 3.1, Fig. 3.1). During routine vaccination with VBTSS of the Russian Federation, a controlled epidemiological experiment was carried out on 181 male volunteers aged 18-22 years, which also took into account the order of increase in the titer of specific antibodies in paired sera in the RPGA.

Table 2

Immunological effectiveness of vaccines

VBTHSJ OJSC "Uzbiofarm" and VBTSS RF

Groups according to the order of increase in AT titer	**Number of persons**			**Immunological effect**
	Abs. h.	**B %**		
VBTHSJ vaccine (JSC Uzbiopharm) (n=99)				
+ 0 (0th group)	9	**9,09**	**33,33**	Absent
+ 1 (1st group)	24	**24,24**		
+ 2 (2nd group)	26	26,26	57,58	Weak
+ 3 (3rd group)	31	31,31		Moderate
+ 4 (4th group)	5	**5,05**	**9,09**	Expressed
+ 5 (5th group)	4	**4,04**		
Total:	99	100		
VBTSS vaccine (RF) (n=181)				
+ 0 (0th group)	3	**1,66**	**25,42**	Absent
+ 1 (1st group)	43	**23,76**		
+ 2 (2nd group)	68	37,57	62,98	Weak
+ 3 (3rd group)	46	25,41		Moderate
+ 4 (4th group)	18	**9,94**	**11,60**	Expressed
+ 5 (5th group)	3	**1,66**		
Total:	181	100		

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Characteristic for vaccination with VBTSS (RF) was that in 46 (25.41%) people (groups 0 and 1) out of 181 (100%) the immune response did not manifest itself and there was no protective antibody titer, while in 135 (74.03%) of vaccinated individuals showed varying degrees of immunological effectiveness. Of the total number of subjects, the group of people with a pronounced immune response to the influence of the vaccine antigen (4th and 5th groups) consisted of 21 (11.60%) vaccinated people (Table 2, Fig. 1).

So, the immunological effectiveness of VBTHSJ JSC "UZBIOPHARM" amounted to 66.66% of the total number of vaccinated people, while the immunological effectiveness of VBTHS (RF) was slightly higher and amounted to 74.58%. VBTHSJ JSC "UZBIOPHARM" in 33.34% of vaccinated people, and VBTHS RF in 25.42% of vaccinated people did not show an immunological effect (Table 2, Fig. 1).

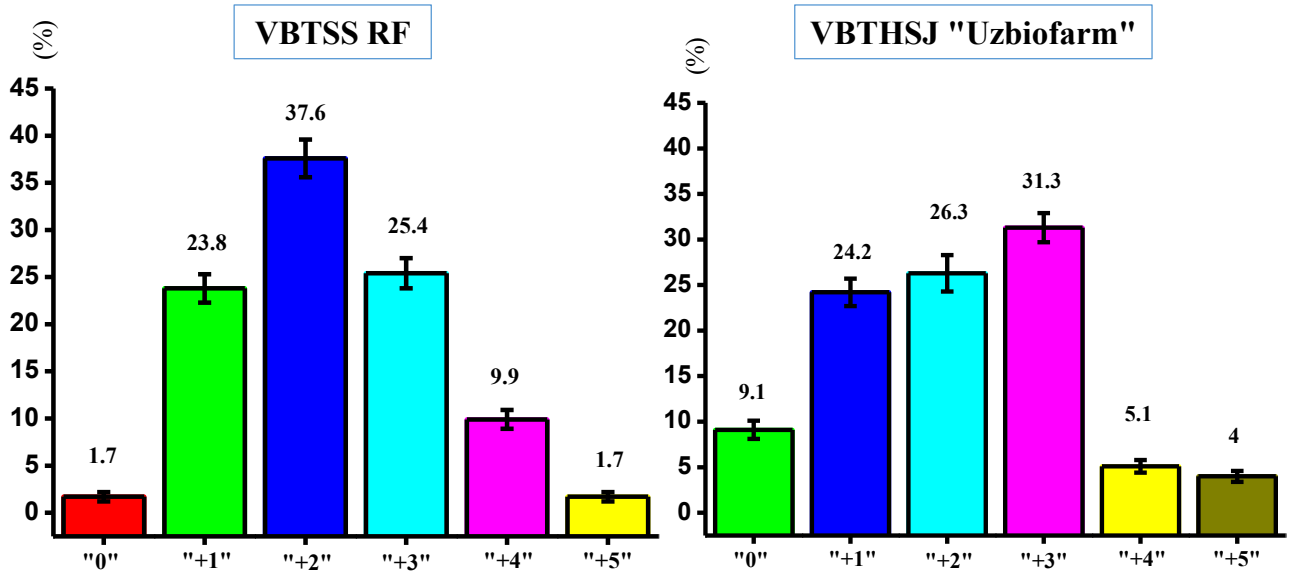

Fig. 1. Distribution of vaccinated people by titer increase ratio specific antibodies during vaccination VBTHSJ OJSC "Uzbiofarm" and VBTSS RF

The effect of Immunomodulin on the immunological effectiveness of the vaccine when vaccinated with VBTHSJ OJSC "Uzbiopharm"

In order to find ways to increase the immunological effectiveness of typhoid vaccines, we studied the effect of a domestic immunobiological drug Immunomodulin on the immunological effectiveness of VBTHSJ JSC "UZBIOPHARM". For this purpose, when vaccinating against typhoid fever, 63 volunteers simultaneously with VBTHSJ of OJSC “UZBIOPHARM” received Immunomodulin intramuscularly at a dose of 150 mcg (experimental group). The control group consisted of the indicators of 99 individuals vaccinated with VBTHSJ of OJSC “UZBIOPHARM” and who did not receive Immunomodulin.

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The research results made it possible to establish that after simultaneous exposure to VBTHSJ OJSC "Uzbiofarm" and Immunomodulin, the number of people with no immunological effect of the vaccine (groups 0 and 1) were 1.59% and 3.17%, respectively, against 9.09% and 24.24% in the control group. That is, under the influence of Immunomodulin, the number of people with a weak immunological effect of the vaccine (group 2) also significantly decreased to 9.52% versus 26.26% in the control and the number with a moderate immunological effect increased to 57.14% versus 31.31 % in control. Immunomodulin also contributed to a significant increase in the proportion of people with a pronounced immunological effect of the vaccine (groups 4 and 5), respectively, to 15.7% and 12.7% versus 5.05% and 4.04% in the group without Immunomodulin (Table 3, Fig. 3).

So, the general immunological effect of Immunomodulin was expressed in a significant decrease in the number of people with no immunological effect of the vaccine from 33.33% in the control group to 4.76% in the experimental group, an increase in the number of people with a moderate immunological effect of the vaccine from 31.31% to 57, 14%, as well as an increase in the number of persons with a pronounced immunological effect from 9.09% to 28.57%. Under the influence of Immunomodulin, the overall immunological effectiveness of VBTHSJ of Uzbiopharm OJSC increased from 66.66% to 95.17% (Table 3, Fig. 3). That is, Immunomodulin had a pronounced inducing effect on the processes of antibody genesis after vaccination with the typhoid vaccine.

Table 3

The influence of Immunomodulin on the immunological effectiveness of the typhoid vaccine VBTHSZh OJSC "Uzbiopharm"

Groups according to the order of increase in AT titer	VBTHSZh OJSC "Uzbiopharm"			VBTHSZH JSC "Uzbiopharm" + Immunomodulin			Immunological effect
	Abs.	**B %**		**Abs.**	**B %**		
+ 0 (0th group)	9	**9,09**	**33,33**	1	**1,59**	**4,76**	**Absent**
+ 1 (1st group)	24	**24,24**		2	**3,17**		
+ 2 (2nd group)	26	26,26	57,77	6	9,52	66,66	Weak
+ 3 (3rd group)	31	31,31		36	57,14		Moderate
+ 4 (4th group)	5	**5,05**	**9,09**	10	**15,87**	**28,57**	**Expressed**
+ 5 (5th group)	4	**4,04**		8	**12,70**		
Total:	99	100		63	100		

CONCLUSIONS

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1. The immunological effectiveness of the typhoid vaccine VBTHSZh OJSC "Uzbiofarm" was 66.66%, and the vaccine BTVSS RF - 74.58%.
2. Immunomodulin contributed to an increase in the effectiveness of the VBTHSJ vaccine of Uzbiopharm OJSC from 66.66% to 95.17%.

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