The study of the Profort probiotic use in the specific prevention of salmonellosis in calves

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Abstract. In order to increase the post-vaccination immune response during vaccination of calves against salmonellosis, a test was carried out with an inactivated emulsified vaccine against the background of the use of the probiotic Profort. The studies were carried out on the basis of a large livestock farm in the Voronezh region, unfavorable for salmonellosis of calves. Epizootological, clinical, immunological, hematological, molecular genetic research methods were used in the work. Studies have shown that vaccination of calves against salmonellosis against the background of the use of the probiotic preparation Profort with an inactivated emulsified vaccine contributed to the development of intense cellular immunity – an increase in the total number of lymphocytes and T-cells by 7.0%, B-cells – by 2.8%, phagocytic activity of neutrophils - by 5.9%, phagocytic number – by 7.2%, phagocytic index – by 7.0%, as well as humoral immunity factors – BaS by 3.0%, LaS – by 3.0%, CaS – by 1.7%, O- and H-agglutinins to salmonella antigen – 1.5 and 2 times, respectively. The use of Profort increases the protective properties of the vaccine against salmonellosis, helps to reduce the incidence by 13.3%, and increase the safety of young animals by 26.6%. Therefore, to optimize the use of Profort probiotic, it is necessary to take into account its immunomodulatory effect.

1 Introduction

The intensive development of meat and dairy farming is aimed at obtaining high quality products. Taking into account the extraordinary importance of microbial biocenosis in maintaining animal homeostasis, there is currently a tendency to widely use probiotics during critical periods of animal life to smooth out immunosuppressive situations caused by feed stresses (when changing diets), technological stresses (during rearrangements, during specific prevention of infectious diseases). Probiotics, being cultures of microbes that are symbiotic with the normal microflora of the gastrointestinal tract, suppress the vital activity of pathogenic and opportunistic intestinal bacteria, thereby improving the absorption of feed nutrients, activating metabolic processes [1, 2]. They are introduced in a small amount, but, nevertheless, they contribute to the stimulation of the functional reserves of the animal

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body, the formation of stable immunity, the improvement of the physiological state and the increase in productivity.

One of the most important qualities of probiotics is that with possible technological stresses, errors in feeding and keeping, the negative consequences in animals against their background are significantly smoothed out. The use of probiotics developed on the basis of microorganisms that are representatives of the normal microflora does not limit the sale of products even with modern quality control methods, and the latter can be sold as environmentally friendly [2].

One of these products is Profort, a multifunctional feed additive produced by the Biotrof company (St. Petersburg, Pushkin). This feed additive combines the qualities of an enzyme and a probiotic. The Profort supplement contains strains of two types of bacteria – Enterococcus faecium and Bacillus subtilis, which are able to quickly colonize the gastrointestinal tract of calves, suppress the development of pathogenic and opportunistic microorganisms due to the production of antimicrobial substances, and reduce the negative impact of bacterial and fungal toxins on the host organism [3, 4].

Among the diseases of young cattle that occur against the background of dysbiosis of various etiologies, salmonellosis is very often recorded. Salmonella infection causes huge economic losses due to the death and culling of animals, and also causes toxic infections of alimentary origin in humans, and Salmonella themselves are reservoirs of antibacterial drug resistance genes [5-8].

In Russia, the most common serotypes of Salmonella in calves are S. dublin, S. typhimurium, and S. enteritidis [9]. Taking into account the widespread distribution of Salmonella in animal husbandry, the main task of veterinary specialists is to carry out preventive measures – specific prevention. To prevent salmonellosis in young cattle in our country and abroad, live and inactivated vaccines are used. With intensive livestock management technology, many authors note a general immune deficiency in young animals, which inevitably leads to a decrease in the adaptive capabilities of the animal organism and an increase in susceptibility to various infections [10-12]. Therefore, the organization of specific prevention of salmonellosis requires the search for ways to increase its effectiveness [13].

Relevant for the safety of livestock in conditions of trouble for salmonellosis is to increase the natural resistance of the body and correct physiological immunodeficiency, tension and duration of post-vaccination immunity.

Specific prophylaxis allows solving this problem, however, for its success, the selection of a vaccine, taking into account the epizootic situation at the enterprise, is of paramount importance. Inactivated vaccines, despite their relatively low immunogenicity, do not lose their relevance, since they allow immunoprophylaxis against the background of immunosuppression in animals, while the use of a live vaccine in this situation can lead to animal disease [14].

2 Objectives

To solve the problem of increasing specific anti-Salmonella immunity in calves, we studied the effect of the probiotic preparation Profort on the indicators of specific and non-specific factors of the body's immune defense when used in combination with an inactivated emulsified vaccine against salmonellosis in cattle.

3 Materials and methods

The experimental part of the work was carried out on a large livestock complex in the Voronezh region, which is unfavorable for calf salmonellosis. Research methods were used in the work – epizootological, clinical, pathoanatomical, bacteriological, immunological, hematological, molecular genetics. 3 groups of calves weighing 35-40 kg were formed, 15 units in each Holstein-
Friesian breed at the age of 10 days, obtained from cows not immunized against salmonellosis and selected according to the principle of analogues.

Animals of the first and second groups received an inactivated emulsified vaccine against salmonellosis in cattle (JSC BelVitunifarm) at a dose of 1 cm³ twice intramuscularly with an interval of 10 days. Animals of the 2nd group from the fifth day of life for 30 days received 15 g per unit per day of feed additive Profort. Animals of the third group were intact.

The calves were clinically observed for 60 days. Morbidity, the number of culled animals, as well as safety by the 60th day were taken into account. In culled animals, the biomaterial was examined by polymerase chain reaction (PCR) for salmonellosis using the SAL-COM test system for diagnosing salmonellosis (manufacturer Interlabservis, Moscow).

To assess the effect of the probiotic on the immunological reactivity of animals in experimental animals, 30 days after the introduction of the second dose of the vaccine, the titer of specific anti-Salmonella agglutinins to O- and H-antigen was determined in the agglutination test (AT) according to the generally accepted method, the level of antibodies was expressed in geometric mean titers in base 2 logarithms (log₂) and also carried out the determination of the content of T- and B- lymphocytes, bactericidal (BaS), lysozyme (LaS) and complementary activity (CaS) of blood serum of calves, phagocytic activity of leukocytes (PAL), phagocytic number (PN) and phagocytic index (PI). To prepare O- and H-antigens for test-tube agglutination reaction, the collection strain of Salmonella enteritidis №11272 (passport of the strain №100451, State Research Institute for Standardization and Control of Medical Biological Preparations named after V.I. L. A. Tarasevich, Moscow). The antigen was prepared under laboratory conditions according to the generally accepted method: as an antigen, a wash of Salmonella enteritidis agar culture (10 billion m.t. in 1 ml of saline) was used. H-antigen was obtained by culture inactivation with 1% formalin solution; O-antigen – by heating for 30 minutes at 70°C.

Isolation of lymphocytic cells was carried out in a single-stage density gradient of verografin: T-lymphocytes – by the method of spontaneous formation of rosettes with ram erythrocytes (T-ROK); B-lymphocytes – in the EAC-ROK reaction on the receptor for the third complement component.

Determination of the number of T-lymphocytes in the blood serum of experimental animals was carried out using E-rosette formation. 0.1 ml of a suspension of 0.5% sheep erythrocytes and 0.1 ml of lymphocytes were alternately added to plastic centrifuge tubes and incubated at 37°C for 15 minutes. Then the tubes were centrifuged at 1000 rpm for 5 minutes and kept in a refrigerator (+4°C) for 16-18 hours. At the end of the incubation period, to fix the rosettes, 50 µl of 3% solution of (freshly prepared) glutaraldehyde was added to the test tubes without stirring the sediment and kept at room temperature for 20 minutes. Fixation was terminated by adding an excess of cold distilled water. The supernatant was removed by adding 0.2 ml of buffer, carefully resuspended with a pipette 8-10 times, and smears were made on degreased slides. The smears were fixed with methanol for 5-6 minutes, stained according to Romanovsky-Giemsa, and the reaction of rosette formation was taken into account in a microscope under immersion. The percentage of rosette-forming T-cells was accounted for by the number of lymphocytes that attached at least three sheep erythrocytes and free lymphocytes, at least 200 cells were counted.

To determine the number of B-lymphocytes in the blood of calves, the EAC rosette method was used. The EAC complex and lymphocytes were mixed in equal amounts (100 µl each) in centrifuge tubes, the suspension was incubated at 37°C for 30 minutes, shaking twice. Then centrifuged at 1000 rpm for 5 minutes. The rosettes were fixed for 20 minutes at room temperature by adding 50 µl of freshly prepared 3% glutaraldehyde solution. Fixation was stopped by adding excess cold distilled water, water was removed, the precipitate was resuspended with a pipette in 200 µl of buffer 10-12 times, a smear was...
made, fixed with methanol for 5-6 minutes, stained according to Romanovsky-Giemsa. Lymphocytes that attached at least three indicator erythrocytes were taken into account.

Determination of bactericidal activity of blood serum (BaS) was carried out by nephelometric method. In test tubes with 4.5 ml of sterile meat-peptone broth (MPB), 1 ml of the test serum was added. Then, 0.1 ml of daily broth culture of Escherichia coli was added to all test tubes. The control was MPB in vitro, but without serum. The contents of the tubes were thoroughly mixed, and 2 ml were taken from each sample with a sterile pipette to measure the optical density. The mixture remaining in the tubes (MPB + serum + microbe culture) was placed in a thermostat at 37°C for 3 hours. Thus, 2 indicators are obtained – the first characterizes the optical density of the MPB with culture and serum immediately after mixing, and the second characterizes the optical density of the same mixture after 3 hours of incubation in a thermostat. As a test culture, we used a 24-hour broth culture of Escherichia coli (collection strain E.Coli №25922 (passport of the strain №240533, State Research Institute for Standardization and Control of Medical Biological Preparations named after V.I. L. A. Tarasevich, Moscow). A billion m. of cells in 1 ml of sterile saline on a PEC-56 photoelectrocolorimeter (on the red drum scale, extinction 0.3).

To determine the activity of lysozyme (LaS) in the blood serum, 0.1 ml of the test blood serum was added to each test tube with a micropipette and 1.4 ml of the standard culture of the test microbe of 4 billion microbial suspension of Micrococcus lisodeicticus was added and shaken. The resulting mixture was placed in a thermostat for 1 hour at a temperature of 37°C. The tubes were then shaken again and photometrically measured. The readings on the FEC (FEC-56) were also taken in units of light transmission (on a black scale). To prepare 4 billion microbial suspensions of Micrococcus lisodeicticus, 0.6 mg of acetone powder of the culture was carefully ground in a mortar in 1 ml of buffer. The suspension was standardized by optical density, which was measured on a FEC against a phosphate buffer solution using a green light filter №6 (wavelength 540 nm) in cuvettes with an optical path length of 3 mm.

To determine the complement activity (CaS) of blood serum, 3 ml of the working solution and 0.3 ml of serum were poured into centrifuge tubes. The experiment is accompanied by the setting of 2 controls: the control of the hemolytic system and the control of 100% hemolysis. Experimental tubes, control tubes, erythrocyte suspension and hemolytic serum (diluted) were placed in a thermostat for 30 minutes at a temperature of 37°C. After the specified period, hemolytic serum was mixed with erythrocyte suspension in equal volumes. The resulting hemolytic system was poured into all test tubes, including control tubes, 2 ml each. The contents were stirred and again placed in a thermostat for 30 minutes at a temperature of 37°C (re-mixed after 15 minutes). After that, the samples were centrifuged (except for the control of 100% hemolysis) at 3000 rpm for 10 min. The supernatant was colorimetric on PEC-56. On the day of work, ram erythrocytes were obtained and washed with a working solution until a clear supernatant was obtained. Erythrocyte centrifugation was performed at 3000 rpm for 10 min. 3 times. For work, a 2.5% suspension of red erythrocytes was used. For the hemolysis reaction, hemolytic serum was taken in a 4-fold dilution. The volume in which hemolytic serum was diluted (ml) was equal to the volume of erythrocyte suspension.

To determine the phagocytic activity of blood cells (PAL), 0.5 ml of stabilized test blood and 0.5 ml of a microbial suspension containing 0.5–1 billion Salmonella enteritidis microbial cells per 1 ml were poured into sterile centrifuge tubes. The test tube with the prepared mixture was gently shaken and placed for 30 min in a thermostat or water bath at 37°C. Then 3-5 smears were made from the mixture, fixed with methyl alcohol and stained according to Romanovsky-Giemsa. Based on the 100 phagocytes found, the number of cells involved in phagocytosis was determined. The phagocytic index was determined by the average number of phagocyted microbe per active leukocyte. To determine the
phagocytic index, the same blood smears were used, which were used to determine the phagocytic activity of leukocytes. In preparations prepared as described above, at least 100 leukocytes and the number of microbial bodies absorbed by them were counted. The phagocytic index was calculated by dividing the number of phagocytosed bacteria by the number of active leukocytes.

Statistical data processing was carried out according to the Student's criterion using Microsoft Excel.

4 Research results

As a result of the studies, it was found that the background values of anti-Salmonella agglutinins to O- and H-antigen were approximately the same in the groups on average and amounted to: to O-antigen 1.9 log₂, to H-antigen 3.1 log₂, which indirectly indicates the well-being of this group of animals for salmonellosis, since a titer of 1:40 and above is diagnostic (table 1).

Table 1. The titer of specific anti-Salmonella agglutinins to O- and H-antigens on the 30th day after vaccination in log₂.

<table>
<thead>
<tr>
<th>№</th>
<th>Agglutinins</th>
<th>Before vaccination (background, average log₂)</th>
<th>30 days after vaccination, on average, log₂</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n=60</td>
<td>Group number</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>O-agglutins</td>
<td>1.9±0.12</td>
<td>5.5±0.21</td>
</tr>
<tr>
<td>2</td>
<td>H-agglutins</td>
<td>3.1±0.13</td>
<td>6.3±0.31</td>
</tr>
</tbody>
</table>

On the 30th day after the second injection of the vaccine in the first and second experimental groups, an increase in the titer of specific antibodies was noted, and their number differed depending on the drugs used.

In the first group, where the animals were vaccinated only with the vaccine, the titer of agglutinins to the O-antigen was 5.5±0.21 log₂, and to the H-antigen 6.3±0.31 log₂. In the second group, where the probiotic was fed, the titers of specific antibodies exceeded those of the animals of the first group and amounted to 6.0±0.21 log₂ to O-antigen, 7.8±0.15 log₂ to H-antigen.

Table 2. The number of T- and B-lymphocytes in the blood of calves when using miramistin and thymogen in combination with a salmonellosis vaccine

<table>
<thead>
<tr>
<th>Group number</th>
<th>Number of animals in the group</th>
<th>Total number of lymphocytes, ×10⁹/l</th>
<th>Number of T-lymphocytes, %</th>
<th>Number of B-lymphocytes, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>background</td>
<td>after 30 days</td>
<td>background</td>
<td>after 30 days</td>
</tr>
<tr>
<td>1</td>
<td>n=15</td>
<td>3.57±0.16</td>
<td>4.72±0.16*</td>
<td>31.8±2.33</td>
</tr>
<tr>
<td>2</td>
<td>n=15</td>
<td>3.71±0.06</td>
<td>6.08±0.21**</td>
<td>32.3±1.67</td>
</tr>
<tr>
<td>3</td>
<td>n=15</td>
<td>3.19±0.11</td>
<td>3.94±0.14</td>
<td>32.4±2.71</td>
</tr>
</tbody>
</table>

Note: reliability of differences *, **- to the background; ● - to the intact group P<0.05; 0.01 respectively.
In the study of T- and B-lymphocytes in the blood of calves, it was found that in calves vaccinated with immunomodulators 30 days after vaccination, a significant increase in the total number of lymphocytes was noted compared to the background and values of the intact group (table 2). In the first group, the total number of lymphocytes on the 30th day increased by 12.1% compared to the intact group.

On the second day, on the 30th day after immunization, an increase in the content of the total number of lymphocytes was observed - by 15.5% than in intact animals. At the same time, the value of this indicator in the second group was 1.3 times higher than that in the first.

The number of T-lymphocytes on the 30th day after vaccination in the first group practically did not differ from those in the intact group (the difference was only 4.0%). In the 2nd group, against the background of Profort, the values of this indicator turned out to be different – the number of T-lymphocytes in animals of the 2nd group exceeded the indicator of the intact group by 8.0.

A similar trend was observed for B-lymphocytes. Compared with the parameters of the intact group, the increase in the number of B-lymphocytes in the first group was insignificant and amounted to 1.5%, while in the second – 2.8%.

The results of the study of Profort on the dynamics of humoral factors of nonspecific immune defense of the body during vaccination with an inactivated emulsified vaccine against salmonellosis in cattle are presented in table 3.

It was found that the level of BaS in the first group compared with the intact group was higher by 1.9%; in the second – by 3.0%. The LaS and CaS indices correlated with the BaS indices. Thus, according to LaS, the growth in the first group was insignificant and amounted to 1.7%; in the second – 3.0%, respectively. The increase in CaS in the first group was insignificant – by 1.1%; in the second, this indicator exceeded the data of the intact group by 1.7%.

For all three indicators among immunized calves, the highest values were observed in animals vaccinated against the background of the use of Profort.

Table 3. Bactericidal, lysozyme and complementary activities of blood serum of calves during combined immunization of calves against salmonellosis with immunomodulators

<table>
<thead>
<tr>
<th>Group number</th>
<th>Number of animals in the group</th>
<th>BaS, %</th>
<th>LaS, %</th>
<th>CaS, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>background after 30 days</td>
<td>background after 30 days</td>
<td>background after 30 days</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>n=15</td>
<td>69.70± 5.12</td>
<td>75.95± 6.30</td>
<td>27.02± 2.25</td>
</tr>
<tr>
<td>2</td>
<td>n=15</td>
<td>69.21± 4.08</td>
<td>77.11± 5.10*</td>
<td>26.87± 3.13</td>
</tr>
<tr>
<td>3</td>
<td>n=15</td>
<td>69.55± 4.22</td>
<td>74.09± 3.49</td>
<td>27.11± 2.08</td>
</tr>
</tbody>
</table>

Note: reliability of differences * - to the background; ● - to the intact group P<0,05 respectively.

The results of the study of the phagocytic activity of leukocytes on the 30th day of the study showed that in animals, vaccination against the background of the use of Profort had a pronounced effect on the cellular link of nonspecific defense of the calves' organism (table 4). An increase in PAL was noted in the 2nd group – by 13.0% compared with the intact group on the 30th day after vaccination. In calves immunized only with the vaccine, the increase in the level of PAL exceeded the indices of the intact group by 2.7%.
The phagocytic number in the first group during this period practically did not differ from the values of the intact group and was the most by 5.0%, in the second PAL by 7.2%.

The phagocytic index in the first group exceeded this indicator of the intact group by 6.0%, in the second PAL by 7.0%.

Thus, among the experimental groups, lower values of PAL, PF, and PI were observed in the first group compared to the second.

**Table 4.** Phagocytic activity of leukocytes (%), phagocytic number (microbial particles (m.ch.) and phagocytic index (m.ch.) in calves 30 days after vaccination with immunomodulators.

<table>
<thead>
<tr>
<th>Group number</th>
<th>Number of animals in the group</th>
<th>PAL, %</th>
<th>PN, m.h.</th>
<th>PI, m.h.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>background after 30 days</td>
<td>background after 30 days</td>
<td>background after 30 days</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>n=15</td>
<td>82.52±5.15 86.19±7.21</td>
<td>6.86±0.52 7.41±1.15</td>
<td>8.05±2.33 8.60±2.95</td>
</tr>
<tr>
<td>2</td>
<td>n=15</td>
<td>81.41±6.65 89.44±7.93</td>
<td>6.56±0.43 7.59±1.46</td>
<td>7.93±2.47 8.77±3.12</td>
</tr>
<tr>
<td>3</td>
<td>n=15</td>
<td>81.58±4.20 83.49±7.36</td>
<td>6.76±0.31 7.08±1.62</td>
<td>7.86±2.16 8.11±1.98</td>
</tr>
</tbody>
</table>

Note: reliability of differences *, **, *** - to the background; ●, ●● - to the intact group.

Clinical observations of experimental calves up to 60 days of age showed that in the intact 3rd group, the largest part of the animals – 11 units (73.3%) – had gastrointestinal diseases during their transition to rearing (up to 45 days of age) with severe flow and culling. In the first group, the incidence up to 45 days of age was 5 units (40%), up to 60 days of age – 11 units (73.3%), while the average severity of the disease was recorded.

There were no severe cases of diseases among the calves of the 2nd experimental group on the background of feeding the probiotic Profort. In this group, up to 45 days of age, 3 units (20.0%) were ill, up to 90 days – 6 units (40.0%), culling was 2 units. In a molecular genetic study, the Salmonella genome was found in the biomaterial (feces) of diseased calves (Table 5).

**Table 5.** Morbidity and safety of calves of experimental groups.

<table>
<thead>
<tr>
<th>Group number</th>
<th>Number of animals in the group</th>
<th>Incidence under 45 days of age</th>
<th>Incidence as low as 60 days of age</th>
<th>Rejected (fell)</th>
<th>Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unites/%</td>
<td>Unites/%</td>
<td>Units/%</td>
<td>Units/%</td>
<td>Units/%</td>
</tr>
<tr>
<td>1</td>
<td>n=15</td>
<td>5/33.3</td>
<td>11/73.3</td>
<td>7</td>
<td>9/60.0</td>
</tr>
<tr>
<td>2</td>
<td>n=15</td>
<td>3/20.0</td>
<td>6/40.0</td>
<td>2</td>
<td>13/86.6</td>
</tr>
<tr>
<td>3</td>
<td>n=15</td>
<td>11/73.3</td>
<td>12/80.0</td>
<td>12</td>
<td>3/20.0</td>
</tr>
</tbody>
</table>

Table 5 shows that the lowest survival rate of calves (13.0%) was found in the 3rd group, where the calves were not vaccinated. The highest safety (100%) was noted in the 2nd group, where the vaccine was used against the background of Profort. The safety of animals in the 1st group, where only the vaccine was used, was 60.0%, which exceeded the indicators of the intact group by 40.0%, but was lower than the 2nd group by 26.6%.
5 Discussion

According to many researchers, the prevention of dysbiosis of the gastrointestinal tract with the use of probiotics is aimed at normalizing the composition of the microflora of the gastrointestinal tract, increasing immunity, and also improves health, increases the safety and productivity of farm animals and poultry [15, 16]. The use of a multifunctional feed additive in our experiment, a complex action that combines the qualities of an enzyme and a probiotic that promote the synthesis of lactic acid and cyanocobalamin (vitamin B\textsubscript{12}), had an impact on the indicators of the general specific reactivity of animals. This was due to the fact that lactic acid stimulates the regeneration of the intestinal epithelium, and Vitamin B\textsubscript{12} is involved in the synthesis of nucleic acids and accelerates the restoration of antioxidants in the body, which destroy free radicals and cleanse the body of harmful substances.

The conducted studies showed that immunization of calves obtained from mothers not immunized against salmonellosis with an inactivated vaccine against salmonellosis against the background of feeding the probiotic Profort provided a pronounced stimulation of a specific humoral and cellular response. In the formation of anti-Salmonella immunity in calves, the use of the probiotic contributed to a significant increase in the titers of O-agglutinins by 9.0%, H-agglutinins – by 24.0% compared with simply vaccinated animals, which confirms the ability of the drug to stimulate antibody genesis.

A more significant increase in the total number of lymphocytes and their T- and B-populations in the blood of animals was also observed in calves vaccinated against the background of probiotic treatment of calves, which indicates a pronounced immunological reorganization of the calves' organism under the action of the drug. In intestinal infections, it is lymphocytes that play a leading role in the implementation of cellular immunity of the body.

Vaccination against the background of Profort also caused the formation of a higher level of nonspecific humoral and cellular immunity factors in calves (BaS, KaS, LaS, PAL, PN, PI).

It is known that various strains of probiotics that stimulate or suppress inflammatory responses have different effects on the differentiation of T-lymphocytes, have local effects and trigger systemic reactions as a result of translocation, influence on the microbiota and the functional state of mucous membranes. Therefore, after analyzing the obtained results and literature data [15, 16], we can conclude that the mechanism of action of Profort during vaccination can be based on an increase in the permeability of the cytoplasmic membranes of lymphoid cells and an increase in their metabolism, as well as an intensification of the functional activity of phagocytes, as a result of which the latter are more effectively carry out phagocytosis and antigen presentation to immunocompetent cells, and this leads to the formation of more intense immunity.

6 Conclusion

The conducted studies have shown that in a farm that is unfavorable for salmonellosis, the incidence of calves up to 90 days of age is 87.0%, while the proportion of dead and culled animals is so high that the survival rate reaches only 13.0%.

Immunization of young animals with an inactivated emulsified vaccine against salmonellosis in cattle helps to reduce the incidence of calves by 14.0% and increase the safety of young animals by 40.0%.

The use of an inactivated vaccine against salmonellosis against the background of a probiotic contributes to the formation of intense cellular immunity: an increase in the total number of lymphocytes and T cells by 7.0%, B cells - by 2.8%, phagocytic activity of neutrophils – by 5.9%, phagocytic number – by 7.2%, phagocytic index – by 7%, as well as factors of humoral
immunity – BaS by 3.0%, LaS – by 3.0%©, CaS – by 1.7%, O- and H- agglutinins to the salmonella antigen by 1.5 and 2 times, respectively.

The use of Profort increases the protective properties of the vaccine against salmonellosis, helps to reduce the incidence by 13.3%, and increase the safety of young animals by 26.6%. Therefore, to optimize the use of probiotics, their immunomodulatory effect must also be taken into account.

References