

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The History of the Development of Hyper Immune's Serums and Their Practical Application.

Vladimir Ivanovich Trukhachev*, Valentin Sergeevich Skripkin, Marina Nikolaevna Verevkina, Alexander Viktorovich Agarkov and Natalia Viktorovna Fedota.

Stavropol State Agrarian University, Faculty of Veterinary Medicine, Zootekhnicheskiy lane 12, Stavropol 355017, Russia.

ABSTRACT

One of the dominant problems in applied immunology is the development of methods and means of prevention and serum serotherapy infectious diseases. Hyper immune serums containing antibodies that have a strictly specific actions to bacterial toxins, pathogenic bacteria or viruses, against which immunized animals. Hyper immune serum as a therapeutic drug, has an undoubted advantage over antibiotics. This is due to characteristics of the disease. In dogs, fur animals of the cellular maintenance, young cattle in the acute course of the disease and untimely diagnosed with antibiotics usually are not effective enough at the time, as the hyper immune serum usually exhibit a pronounced therapeutic effect.

Keywords: serum, seroprevention, serotherapy, antigen antibody.

**Corresponding author*

INTRODUCTION

The first attempt to use a serotherapy to fight infectious disease described in I. Heriourt, Ch. Richet (1888), which prepared the anti-staphylococcal serum and applied it to treat rabbits. History serum production covers more than 100-year period and practically begins with the Bering and Kitazato Research (1890). E. Behring and S. Kitazato received antitoxic serum against diphtheria toxin from hyper immunized sheep, rabbits or dogs. They first showed the possibility of a temporary transfer of state immunity to diphtheria and tetanus animals receiving parenteral route made of antitoxic serum (Tutov IK Sitko VI, 1997). In 1891, E. Behring produced by tetanus toxoid hyper immunization horses. SP Fedorov and FN Remezov (1891) obtained positive results with similar test sera. Diphtheria serum was obtained in Russia in 1895, GK Gabrichevsky, AD Pavlovski et al., And in 1897 - VV Radzevich and NV Butyagin. The therapeutic effect of the immune tetanus toxoid in the experiment on humans, cases of tetanus was obtained in 1895 SP Fedorov. Serum against streptococcal infection received A. Marmerek (1895) and H. Aronson (1896). Serum was prepared against dysentery N. Shiga (1898). Specific serum against gas gangrene was in 1910 M. Weinberg. The ability to manufacture rabies serum studied Babes and Herr in 1889 (GV Vygodchikov, 1964) [1, 2, 3, 4, 5, 6].

Tetanus toxoid in Russia received AA Dedyulin, FP Bautz, SN Vyshelesski, NA Mihin et al. (SG Kolesov and GI Romanov, 1981). In the first half of XX century had obtained serum treatment against smallpox, yellow fever, influenza, tick-borne and Japanese encephalitis, plague and other diseases (SP Karpov, S. Praeger, GE Sinelnikov VV Fedorov, 1976) [7, 8, 9, 10].

Preventive properties of whey people recover from leptospirosis established R. Inada, I. Ido (1918), cattle - FI Tenth and GL Polyakov (1939). In the former USSR serum against human leptospirosis it was proposed in 1931 VI Terskikh against leptospirosis and animals - in 1947 SY Lyubashenko [11, 12].

Serum against salmonella was first obtained in 1892, E. Roux and A. Yersen. B (1940) AG Malyavin serum produced against salmonellosis have antimicrobial and antitoxic action, and in 1945-1950 gg. developed a method of producing paratyphoid serum in 1967-1970 developed and introduced into production two therapeutic serum: polyvalent serum against paratyphoid calves, pigs, lambs, sheep and birds and hyper immune serum against paratyphoid and coli bacteriosis calves, pigs, lambs, sheep and birds for receipt of which used 16-24 strain of Salmonella and 30 strains of Escherichia [13, 14, 15].

In 1983, AP Medvedev has perfected a method of obtaining and control serum against Salmonella; I studied the intensity of the immune response during hyper immunization oxen; it reduced the number of strains belonging to the antigen to 16-24 to 4; He developed a quantitative method for monitoring the protective activity of serum in laboratory animals. Interest in the sera increased in recent years due to the formation of antibiotic-resistant strains of microorganisms and insufficient therapeutic activity of the individual drugs (GV Vygodchikov, 1964). In animal serum is prepared and use in the treatment and prevention of anthrax, leptospirosis, tetanus, botulism, salmonellosis, colibacillosis, pasteurellosis, swine erysipelas, streptococcosis et al. Disease (DF Osidze, 1981) [16, 17, 18, 19].

In medical practice and get used serum against botulinum, gangrene, typhoid, tetanus, cobra, viper and others. Of these sera obtained globulins: rabies, tick-borne encephalitis, influenza, smallpox, and other anti-staphylococcal. Of paratyphoid, serum in 1967-1970 developed and introduced into production two therapeutic serum: polyvalent serum against paratyphoid calves, pigs, lambs, sheep and poultry and hyper immune serum against paratyphoid and coli-bacillus's calves, pigs, lambs, sheep and birds. These sera were used 16-24 strain of Salmonella and 30 strains of Escherichia [20, 21, 22].

The researchers has identified the therapeutic effect of the use in various diseases of nonspecific serum, such as AA Stein, GL Pashkevich, ETC. Afanasiev (1951) observed the beneficial effect of diphtheria serum in patients with leprosy [23, 24, 25].

IN Bychev (1971), uses hyper immune serum against salmonella, plague, erysipelas, hemorrhagic septicemia, received a positive result in the treatment of edema disease of pigs. VV Skorodinskaya and NE Shchastny (1960) was using for the prevention of scarlet fever, polio and other diseases measles serum. AP Simpletons, Y. Malakhov, LI Trusov (1983) conducted a comparative assessment of the therapeutic efficacy of

polyvalent serum against leptospirosis and animals against *Leptospira* immunoglobulin and set a high preventive activity of these drugs [26, 27, 28].

HZ Gafarov, KN Sharafundinov et al. (1978), VP Blueberry, BJ Birman (1988), SM Suleymanov, PI Baluza (1988), NV Tit, VV Maksimovic (1989), NN Androsik (1989), RS Halle, VD Nikolsky et al. (1991), S.Alexandersen, S. Larsen (1989), JG Zelyutkov, TV Kurdakova (1994), VM Matveeva, MB Srynbaev, GG Rahtmbaev (1994), AA Shevchenko, IA Bakulov et al (1994) tries to make and use the serums against viral diseases of animals [29, 30].

The handbook «Infectious Diseases of Animals» (1987) provides guidance on the prevention and treatment of hyper immune serum of diseases such as bovine virus diarrhea, viral enteritis of geese, hepatitis dogs, anthrax, colibacillosis, swine erysipelas, and others. The high activity of the hyper immune serum against anaerobic enterotoxaemia calves and rabbits showed FN Buhtilov, II Volotko, NS Buhtilova (1981) [31].

Antitoxic serum *Cl. perfringens* types A, C, D and got experienced L.B. Kirillov NA Lagunin (1981). ON. Lagunin, VA Polyakov (1985) received the serum of animals against botulism, which has a pronounced protective effect. GL Sobolev, VI Belousov, B.C. Soloviev et al. (1981), GL Sobolev and LA Rozhdestvina (1986), LA Rozhdestvina (1988, 1992) reported high serum preventive activity against leptospirosis animal calf, while the antibody titer in calves raised to 1: 80-1: 160 and stored up to 10-20 days. Preventive Activity calf serum for golden hamsters to *Leptospira Pomona* remained to 5, *Canicola* - up to 6 days. DG Zakharov AA Manichev GI Romanov et al. (1987) demonstrated the efficacy of serum against anthrax received hyper immunization oxen vaccine strains. Serum against botulism mink used for LV Kirillov, N. Lagunin et al. (1988). YA Malakhov (1991) indicates the positive results of the treatment of salmonellosis, leptospirosis, ehsherihoza hyperimmune serum. The release and antitoxic serum against ehsherihoza animals received YA Malakhov OA Tugarinov, MK Pies (1993). Serum concentrations of antibodies is highly adhesive to the antigens and toxins of *Escherichia*. RV Dushuk, JI.A. Podlesnykh et al. (1993) reported high therapeutic and prophylactic efficacy of serum against swine erysipelas [3, 4, 8, 32].

VA Gavrillov (1996) reported in a brochure that Basil plant biologics preparing polyvalent serum against infectious bovine rhinotracheitis, parainfluenza-3 virus diarrhea and adenoinfektsii cattle. Polyvalent serum against distemper, hepatitis and parvovirus infection carnivores. Widely used polyvalent serum against salmonellosis, pasteurellosis, and parainfluenza bovine rhinotracheitis [24].

Hyper immune serum are of particular interest as a therapeutic and prophylactic preparations and raw material for specific immunoglobulins. From waste whey production (fibrin blood cells) obtained hydrolysates used as the basis of culture media for culturing bacteria (AP Prostyakov, LI Trusov et al., 1985; Whisper NG, ps.f. . Fissenko et al.) [16].

In medical Bioindustry serum and plasma used as raw materials for the production of immunoglobulin, albumin, protein, albuveeta, fibrinogen, transferrin, plasminogen, etc. fibrinolizina (AP Prostyakov, LI Trusov, YS Yakovlev et al., 1985; Yu Kosenko, TN Grytsyn, AP Prostyakov, LI Trusov, 1987). For the prevention and treatment of many diseases of animals, specific immunoglobulins used as drugs that are more effective. II Kazan, VE Korneev, ZI Deryabin (1960) received the FMD serum immunoglobulin from convalescent and applied it for the prevention of foot and mouth disease in piglets suckling. VZ Bondarenko (1981) showed in experiments on white mice a high level of preventive properties of the immunoglobulin against erysipelas. LS Kolabskaya, ETC. Kolupaeva, AP Prostyakov et al. (1981) have made of the Bonn blood geese convalescent immunoglobulin, which increases the safety of the birds. LS Kolabskaya, AP Prostyakov, ETC. Kolupaeva et al. (1981) used the immunoglobulins from the serum of the hens to enhance non-specific resistance of the bird. Non-specific immunoglobulins were isolated from the blood of bulls NA Kavenkin, VN Simonović et al. (1983). They found that immunoglobulins have a preventive effect in acute respiratory diseases [12, 17, 29].

LI Rubtsov, JI.C. Kolabskaya, AP Prostyakov, NV Silaeva, AA, Boyko (1984) prepared a «serum immunoglobulins hens» (TU 46-12-699-80) and «nonspecific Aviaglobulin» (TU 46- 12-969-81). These drugs have a general stimulating effect, a positive effect on growth and development of chickens [21].

P.P. Valeev, NS Martynov, VT Hook (1987) obtained from the serum of turkey preparation «Aviaglobulin-I.» Average daily gain of the drug in the experimental group was 15.7 g in the control group - 14.3 g, and the safety of livestock, respectively 88.8% and 74.2%. According to DF Osidze (1981, 1987), specific immunoglobulins not lost their importance in the prevention and treatment of rabies, foot and mouth disease, Aujeszky's disease, goat pox, fowl pox, anthrax, leptospirosis, etc. ehsherihioza diseases. A. Asted, C. Alexandersen, M. Hansen (1988) have shown high efficiency of immunoglobulin in the treatment of Aleutian Disease. In experiments Al Zhbrykunova, VF Sviridenko, FM Shaliev, KK Abdulaev (1988) prophylactic efficacy of immunoglobulin was 90-100%, therapeutic - 65-95%. Specific immunoglobulin successfully treated enterotoxemia sheep and anaerobic dysentery lambs (Yu Gorelov, AF Safonov, TZ Kolesnikov, 1991). Expand the essence of the therapeutic effect of sera tried many scientists, since the end of the last century [12, 28].

In 1895 Il Metchnikoff and Bordet discovered that the serum enhances the phagocytic activity of leukocytes. Il Metchnikoff suggested that the immune serum contains special substances «Stimulin». Later, normal serum substances that activate phagocytosis called «opsonized» and immune – «bacteriotropin» (F. Heufeld, 1904). According to S. Elberg (1957), immune serum prevents macrophages from degeneration. E. Sorkin (1959) argues that serum antibodies fixed to the surface of the microbial cell; it facilitates the capture of white blood cells and intracellular digestion [17, 21].

The presence of the immune serum agglutinins ensures the formation of agglutinates which actively captured by macrophages. Lapresle (1953) reported that in the presence of antibodies increases dramatically proteolysis of the antigen with the specific antibodies remain intact and able to perform their functions. F.I. Dixon, D.N. Talmage (1951), L.Melcher, M. Schimkin (1953) and others have found that passive immunization of a rapid absorption and destruction of the antigen. The absence drastically reduces efficiency of opsonic phagocytosis (FR Furth, 1947; NA Verbmch, RK Peterson, 1978; PCI Leigh, Van den Barselaar, M.Th. van Zwert, 1979; HE Buxot, 1981) [11, 20].

It is known that opsoniruyuschaya serum activity is linked with the presence of certain immunoglobulin classes: A, D, E, F, G, of which A, D, G, M stipulate specific immunity, and Ig E has a role in the pathogenesis of allergic diseases. Antibodies G1 form a toxicity, a G2 - antibacterial immunity. The composition of saliva, tears, bile, lymph, the secrets of the bronchial mucosa, intestine include Ig A1, which take precedence in the formation of "local immunity" (F.Bernet, 1964, AE Gurvich, 1965 AE Kolyako , 1965 W. Boyd, 1969; F. Gaurovits, 1969 RV Petrov, 1987; M.Rowley, 1962; G. Nossel, 1983; L. Clay, M. Steward, 1983; DN Lazarev , EK Alekhin, 1985, etc.) [4, 8, 9].

According to MV Zemskova, VI Sokolov (1977), Horsch F. (1977), DF Osidze (1987), Yu Malakhova (1995) et al., The antibody can generally affect the microorganisms in two ways. Origin - antibody alters the surface of microbes so that lysozyme reacts with mural peptides of the cell wall and its rupture occurs. Another way - the antibody alters the surface of microorganisms so that microbial cells become more accessible to its absorption of phagocytes [7, 23, 31].

Large animals usually prepare therapeutic serum: oxen, horses, donkeys, sheep, and diagnostics - from rabbits. Cattle were used as producers in the preparation of hyper immune serum against leptospirosis SY Lyubashenko (1947), swine erysipelas - ES Nikolaev (1954), salmonellosis calves, pigs, lambs, sheep and poultry - AG Malyavin (1970, 1974), klostridioza - LV Kirillov, N. Lagutin (19810, botulism - LV Kirillov NA Lagunin, EA Polyakov V. Gushchin (1988) and others. In medical practice, from the blood of cattle getting tetanus, dysentery, influenza and al. serum [14, 19, 30].

CONCLUSION

These literature data suggest that hyper immune serum immunoglobulins and other blood products possess curative, preventive and general stimulating effect. The best producers, according to most scholars, is the horse. They have a high immunological reactivity, convenient to the care, maintenance and manipulation associated with the administration of the antigen, blood collection, etc. However, due to a sharp reduction in the number of horses as producers of hyper immune serum is mainly used oxen. Currently, medical and veterinary Bio industry, the principles of technology of hyper immune serum is one and a complex, long-term and multi-faceted process.

REFERENCES

- [1] Alexandersen S. Passive transfer of antiviral antibodies restricts replication of aleutian mink leish virus in vivo/ S. Alexandersen, S. Larsen // J. Virol. 1989. T 63. №1. P. 9-17.
- [2] Asted A. Treatment of neonatal aleutian leish virus (ADV) infected mink kits with gammaglobulin containing antibodies to ADV reduced the death rate of mink kits / A.Asted, C. Alexandersen, M. Hansen// Acta veter. Scand, 1988. № 22. P. 323-330.
- [3] Belousov VI Study of preventive activity of the polyvalent serum against leptospirosis in the experience in the golden hamster / VI Belousov, NM Ivanov, VS Solovyov and others. // Prevention and control measures against leptospirosis farm animals / Abstracts 3 Proc. Conf. - Makhachkala, 1981. S. 18-19.
- [4] Bondarenko VZ Immunogenic and preventive properties protivorozhistyh gamma globulins and classes / VZ Bondarenko // Biological drugs against infectious diseases of animals. M., 1981, pp 41-46.
- [5] Buhtilov FN The effectiveness of anti-toxic serum anaerobic enterotoxaemia calves and rabbits / FN Buhtilov, II Volotko, NS Buhtilova // development, testing and state. Control Council. drugs / Abstracts. Proc. Scientific, Conf. M., 1981. S. 89.
- [6] Bychevoy IP / IP Bychevoy // hyperimmune serum at // Pig edema disease. 1971. №1. S. 37-38.
- [7] Dixon F.I. Catabolism of ¹³¹I labelled bovine gammaglobulini in immune and nonimmune rabbits / F.I. Dixon, Talmage D.N. // Proc. Soc. Exper. Biol. Med., 1951. V. 78. P. 123-125.
- [8] Dushuk RV Prevention and control of swine erysipelas / RV Dushuk, LA Podlesnykh, LI Tikhonov et al. // Veterinary Medicine. 1993. №7. S. 52-56.
- [9] Elberg S.S. Crossimmunity between brucella melitensis and mycobacterium tuberculosis/ S.S. Elberg, P.A. Schnaider, I. Fong // J. Exper. Med., 1957. V. 4. P. 545-554.
- [10] Gavrillov VA Basil plant veterinary products / VA Gavrillov // Veterinary Medicine. 1996. №8. S. 37-41.
- [11] Golubnichny VP Experience with convalescent serum for the prevention of respiratory disease in birds / VP Golubnichny, BJ Birman // Veterinary Medicine. 1988. №1. S. 41-42.
- [12] Gorelov Getting specific gamma - globulin against infectious enterotoxaemia sheep and anaerobic dysentery lambs / YM Gorelov, AR Safonov, TZ // Scientific Kolesnikova. foundations tehn. indus. Manuf. vet. biol. drugs / Tez. IV All. Conf. M., 1991, pp 151-152.
- [13] Horsch F. Immunoprophylaxe bei Nutztieren / F. Horsch // VEB Gustav Fischer Verlag. Jena, 1977.
- [14] Karpov SP Hyperimmune serum / SP Karpov SM Praeger, GE Sinelnikov et al., Tomsk, 1976. 378 pp.
- [15] Kavenkin NA Experience in the use of immune globulin for the prevention and treatment of calves with acute respiratory diseases / NA Kavenkin, VN Simonovic, LM Frost et al. // Proc. Scien. works of Leningrad. vet. Institute. - Leningrad, 1983. 41 pp.
- [16] Kazan II Gamma globulin for the prevention and treatment of foot and mouth disease in the animals and Aujeszky's disease / II Kazan, VE Korneev, ZI Deryabin // Veterinary Medicine. 1960. №7. S. 18-19.
- [17] Kirillov LV Getting protivotulinisticheskoy serum type C and its test /L.V burrows. Kirillov, N. Lagunin, VA Polyakov et al. // Improvement of production methods, quality control and standardization of bact. drugs. M., 1988, pp 152-162.
- [18] Kirillov LV Preparation and Testing of a polyvalent serum antitoxic Cl. perfringens types A, C, and D / LV Kirillov, N. Lagunin // Biological drugs against infectious diseases of animals. M., 1981, pp 10-15.
- [19] Kolesov SG Anthrax / SG Kolesov, GI Romanov // In .: Veterinary medicines. M .: Kolos, 1981. pp 163-175.
- [20] Lagunin NA Preparation and testing of sera protivotulinisticheskoy type C / NA Lagunin, VA Polyakov // Methods and tools for diagnosis, prevention and treatment of infectious diseases of animals / Coll. Scien. works. M., 1985. S. 54-57.
- [21] Lapresle G. Fole farvorisant de l'anticorps sur la degradacion in vitro de liantigene par um homogenal tissulaire/ G. Lapresle//C. rend. Asend. Sci., 1953. V. 8. p. 475.
- [22] Leigh P.C.I., Van den Barselaar, M. Th. van Zwert Immunology, 1979. V. 37. P. 453-465.
- [23] Malakhov Biologicals for specific prevention, diagnosis and treatment of animal salmonellosis, leptospirosis and ehsherioza / YA Malakhov // Improvement of the methods of state. Control Council. drugs / Mater. Proc. Scien. Conf. M., 1991, pp 14-16.
- [24] Anton Alekseyevich Nesterenko, Nadezhda Viktorovna Kenijz and Sergei Nikolayevich Shlykov. Res J Pharm Biol Chem Sci 2016;7(1):1214 -1220.
- [25] Melcher L. Effect of rabbit antibody administration on the behavior of ¹³¹I labelled human serum albumin in mice / L. Melcher, M. Schimkin // J. of immunol., 1953. V. 71. P. 275-279.

- [26] Anatoli Georgievich Molchanov, Valeriy Georgievich Zhdanov, Aleksandr Valentinovich Ivashina, Alexey Valerevich Efanov, Sergei Nikolayevich Shlykov and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(6):633-637.
- [27] Vladimir Vsevolodovich Sadovoy, Viktor Ivanovich Guzenko, Sergei Nikolayevich Shlykov, Ruslan Saferbegovich Omarov and Tatiana Viktorovna Shchedrina. Res J Pharm Biol Chem Sci 2015;6(6):613-616.
- [28] Natalja Jurevna Sarbatova, Vladimir Jurevich Frolov, Olga Vladimirovna Sycheva, and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(4):962-965.
- [29] Ivan Vyacheslavovich Atanov, Vladimir Yakovlevich Khorol'skiy, Elena Anatolievna Logacheva, Sergey Nikolaevich Antonov and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(6):671-676.
- [30] Vladimir Ivanovich Trukhachev, Galina Petrovna Starodubtseva, Olga Vladimirovna Sycheva, Svetlana Ivanovna Lubaya, and Marina Vladimirovna Veselova. Res J Pharm Biol Chem Sci 2015;6(4):990-995.
- [31] Shaliko Zhorayevich Gabriyelyan, Igor Nikolaevich Vorotnikov, Maxim Alekseevich Mastepanenko, Ruslan Saferbegovich Omarov, and Sergei Nikolayevich Shlykov. Res J Pharm Biol Chem Sci 2015;6(3):1345-1350.
- [32] Vladimir Ivanovich Trukhachev, Vladimir Vsevolodovich Sadovoy, Sergei Nikolayevich Shlykov, and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(2):1347-1352.