

MODERN ASPECTS OF THE EPIDEMIC PROCESS OF BRUCELLOSIS

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There are more than 100 zoonotic infections in the world, the relevance of which is due to their widespread distribution in regions with livestock-oriented farming, the imperfection of anti-epidemic and anti-epizootic measures, constant super- and reinfection in foci of infection, difficulties in laboratory and clinical diagnostics, a high potential for chronicity and disability of the population due to untimely detection of infection, inadequate treatment and lack of rehabilitation of patients and those who have recovered [8].

One of the most dangerous and socially significant zoonoses, making a significant contribution to the disability of the population, is brucellosis.

Brucellosis is an acute, zoonotic, multisystem infection caused by bacteria of the genus *Brucella*. The causative agent of the disease belongs to the second group of pathogenicity, the routes and factors of infection transmission are varied. The main source of infection is farm animals, mainly small and large cattle. Pigs, horses, camels, dogs, and reindeer can also get sick. Moreover, each type of animal is affected by a certain type of brucellosis pathogen. According to the modern classification, microorganisms pathogenic to humans are classified as *Br. melitensis*, which also includes *Br. abortus*, *Br. suis*, and *Br. canis*, previously considered independent species.

There are known cases when *B. melitensis* (the carriers are goats and sheep) and *B. abortus* (the main host of the pathogen is cattle) migrate to other animals. This is of great epidemiological importance, especially in the case of migration of *B. melitensis*, which is particularly pathogenic for humans, to cattle.

In the works of Kalinovsky A.I. (2006) a significant epidemic danger of mixed-type brucellosis outbreaks in farms where small and large cattle are kept together is shown in conditions that facilitate the migration of *B. melitensis* to cattle.

People of any age are susceptible to the disease. In most cases, people become infected from sick domestic animals when consuming meat and dairy products or when in contact with them (care, feeding, slaughter, etc.). This is the reason for the prevalence of brucellosis throughout the world, and especially in countries where livestock farming is developed.

Most often, people become infected with brucellosis from small cattle, the pathogen of which (*B. melitensis*) causes most severe forms of the disease. Quite often, people become infected with *B. abortus* from cattle, but clinically expressed infection is registered in isolated cases. The mechanism of transmission of the pathogen is varied. The contact route of infection has a pronounced professional nature, since infection occurs when amniotic fluid gets on open areas of the body (during calving, caring for newborn calves, lambs). Also, the contact route of infection is a priority when cutting up carcasses, skins of infected animals. Veterinary workers, shepherds, calf-keepers, milkmaids, workers of slaughterhouses and meat-packing plants are mainly infected.

The alimentary route of transmission of brucellosis is possible when consuming livestock products obtained from infected animals. The epidemiological significance of food products and raw materials of animal origin is determined by the massiveness of seeding, the type of pathogen, and the duration of its preservation. The greatest danger is posed by raw dairy products (milk, feta cheese, cheese, kumiss, etc.), meat and raw materials (wool, astrakhan fur and leather) from goats and sheep sick with brucellosis. Meat poses a significantly lower epidemiological danger, since it is consumed after heat treatment. However, in some cases, if meat and meat products are insufficiently heat treated, they can cause infection with brucellosis [18, 35].

The influence of climatic and geographical factors on the incidence of brucellosis is most likely indirect, due to their influence on human economic activity and, in particular, the process of servicing farm animals. Particular attention should be paid to the time of calving, lambing, care of animals in the postpartum period, after spontaneous abortions in infected animals, as well as the time of bathing and shearing sheep. The maximum number of cases of goat-sheep brucellosis occurs in the spring-summer period. When infected with brucellosis from cattle, the seasonality is less pronounced, which is explained by the long lactation period and infection mainly through milk and dairy products. Nevertheless, the combined effect of natural and economic conditions can contribute to the establishment of brucellosis in a particular territory [18].

In the last decade of the last century, the epizootic and epidemic situation with brucellosis in the CIS countries has sharply worsened as a result of socio-economic transformations, in particular, the intensive process of privatization in agriculture, the emergence of individual, farm, joint-stock farms with the sale of farm animals and livestock products by non-state trading structures. To a large extent, this was also facilitated by the economic difficulties of the transition period in the economy, which led to the weakening of sanitary and veterinary supervision of the import of animals from countries unfavorable for brucellosis, as well as of the livestock of individual farms, which led to the activation of old and the emergence of new foci of brucellosis,

and as a consequence - an increase in the incidence of this infection in the population [8, 11].

The most unfavorable labor prognosis is formed in persons located in foci of cattle brucellosis and foci of a mixed type. The erased, imperceptible onset of the disease, the slow formation of focal manifestations of the disease, inherent in the primary-chronic form of brucellosis when infected with *B. abortus*, determines the detection of such patients, as a rule, only during the period of medical examination with laboratory testing of professional contingents for brucellosis.

In terms of increasing the efficiency of brucellosis monitoring, the choice of optimal methods for high-quality testing of sick people and animals is of great importance. Widely known diagnostic methods cannot always identify all infected people, and there are cases of brucellosis that present particular difficulties for diagnosis. Expanding the diagnostic arsenal through new immunodiagnostic methods will provide new information on the features of the infectious and vaccination processes in brucellosis.

Comparison of clinical and serological data with the results of determining antigen-binding lymphocytes (ABL) of brucellosis specificity in acute brucellosis showed that registration of the first antigen-binding stage of the immune response by determining ABL has a number of advantages over serological and bacteriological studies: higher specificity, high sensitivity and a significant shortening of the test execution time (1 day) compared to bacteriological research.

A major problem is the diagnosis and treatment of infectious diseases in pregnant women, who often have false positive results of serological reactions due to the development of antiphospholipid syndrome. The use of the method for detecting antigen-binding lymphocytes (ABL) of brucellosis specificity in a diagnostic complex allows confirming or excluding the diagnosis of brucellosis with false negative or false positive results of serological reactions of the agglutination type [8].

The pronounced tendency to chronicity of the disease process in brucellosis dictates the need for an in-depth study of the immunogenesis of the disease. In the diagnosis of brucellosis, one of the important aspects is the separation of chronic and residual forms. At present, their differential diagnosis is based mainly on clinical and serological data. According to a number of authors, the difficulties of early diagnosis of brucellosis require the introduction into practice, along with a set of serological reactions, of the polymerase chain reaction (PCR) as an express method [39].

Nurpeisova A.Kh. et al . (2008, 2009) established that the most informative laboratory method for diagnosing chronic brucellosis is ELISA, a positive result of which (according to the likelihood ratio for a positive result) occurs 1.8 times more often in patients with chronic brucellosis than in patients with residual brucellosis. The PCR method has a special diagnostic value in examining contacts in a brucellosis

outbreak, even before the onset of possible clinical manifestation of the disease [29, 40].

Epidemiological surveillance is a complex long-term observation of the infection with a comparative analysis of the level and dynamics of human morbidity in the country as a whole, in individual regions and in specific areas with farms unfavorable for brucellosis. When conducting epidemiological surveillance of brucellosis, it is necessary to take into account the polymorphism of this infection: different duration of the incubation period, frequent chronic course of the disease, non-specific multi-organ symptoms, the possibility of a latent course [30].

The evolution of brucellosis in modern conditions is towards an increase in the frequency of acute brucellosis with early development of focal metastatic and infectious-allergic lesions, aggravating the course of the disease, which indicates the early development of sensitization in patients in an endemic region already in the acute phase of the brucellosis process [8]. Along with this, earlier lesions of the musculoskeletal system are observed (in the first 2-3 months from the onset of the disease), as well as more frequent vascular lesions (scleritis, conjunctivitis, positive tourniquet symptom, etc.), which the authors also explain by early allergic restructuring of the body.

Popov P.N. et al. (2007, 2009), based on many years of studying the problem of brucellosis, consider it necessary to revise and remove from the classification the concept of primary-chronic brucellosis, which is an undetected subclinical form of acute brucellosis, occurring under the guise of other diagnoses due to the absence of pathognomonic signs and the alertness of the attending physician, who did not prescribe specific laboratory tests for brucellosis. That is, in essence, this is secondary-chronic brucellosis as an outcome of acute brucellosis with a masked course. Due to the difficulty of differentiating acute and subacute brucellosis, associated with the earlier appearance of foci and the lack of difference in immunological reactions in these clinical forms, the authors propose combining them into one and identifying them as acute brucellosis [33]. In this regard, a classification is needed that corresponds to modern knowledge about the epidemic process, diagnostics, and clinical picture of brucellosis.

The paper presents the classification of clinical forms of brucellosis developed by the authors, in which, in addition to acute, chronic and residual forms, a subclinical form is distinguished. According to scientists, the presence of a subclinical form in the classification will stimulate alertness among practitioners regarding brucellosis, especially in endemic areas. Also, in this classification, taking into account the early chronicization of modern brucellosis, the initial periods of the chronic form are reduced to 3 months (instead of 6 months according to G.P. Rudnev). Despite the debatable nature of this work, the proposed classification deserves great attention in terms of an

integrated approach taking into account epidemiological, clinical and laboratory data to the diagnosis of brucellosis.

The social aspect of the problem is the disease of young people of working age, as well as children and adolescents with an increasing proportion of people not professionally associated with animal husbandry. According to Suleimenov M.S. (1997), the epidemic process in adolescents has its own characteristics associated with the nature of the epizootic focus. In adolescents engaged in the care of newborn lambs in a public herd, the main epidemiological significance as an infection factor is the milk of ewes. Infection occurs mainly with the 3rd biovar brucella of the goat-sheep species due to the "mammatropism" of the latter. Adolescents engaged in the care of small cattle in private farms (grazing) are infected mainly with the 1st biovar brucella. Acute brucellosis in adolescents, unlike in the adult contingent, developed against the background of hyposensitization, which contributed to the formation of metastatic foci in large and medium joints with frequent relapses of the same localizations at all stages of the disease, aggravating the prognosis of the disease. The author also established a high frequency of chronicity of the disease (58-60%), which is largely due to unfavorable social conditions.

A peculiarity of the current situation with brucellosis is the fact that up to 50.0% ($p < 0.05$) of infected people are registered in farms (points) officially free of brucellosis of farm animals. Such a situation indicates the possibility of the existence of foci of brucellosis that were not promptly detected by veterinary authorities. In these conditions, indicators of not only morbidity, but also infection of the population are of particular importance, since these indicators are of decisive importance in in-depth epidemiological analysis, and in cattle farms they are often the only informative data that allows an objective assessment of the current situation [28].

Prevention and control of brucellosis are carried out on the basis of close cooperation between veterinary and medical sanitary services, since the incidence of brucellosis in humans is assessed by many authors as "epidemic manifestations of the epizootic process" [38].

The main prerequisites for activation of the infection transmission mechanism, the presence of which can lead to the emergence of brucellosis in a specific area, are formulated in the works of Kalinovsky A.I. (2006): epizootological situation in dynamics; professional factor; age groups of the population; annual distribution of morbidity (seasonal factor); biological properties and virulence of brucellae; migration of the pathogen to an atypical carrier and the effectiveness of the integration system between interested organizations. For a possible real manifestation of the epidemic process of brucellosis, the author identified the following harbingers: an increase in the incidence of brucellosis compared to the background; an increase in the infection rate of the population of professional (decreed) groups; the appearance or increase in the

number of abortions of brucellosis etiology in farm animals (activation of the epizootic process).

The methodological basis of the epidemiological process is retrospective epidemiological analysis, which allows identifying priority risk factors, assessing the effectiveness of anti-epidemic measures and establishing the prerequisites for complications of the epidemiological situation for brucellosis. Also of great importance is the prompt monitoring of human brucellosis incidence with the establishment of the characteristics of the manifestation of the disease in various administrative territories, improving the tactics of epizootological and epidemiological examination of brucellosis foci in order to make timely adjustments to the existing system of epidemiological surveillance for brucellosis.

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