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EPIDEMIOLOGICAL STATUS OF LEPTOSPIROSIS AND ITS PREVALENCE (literature review)

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Abstract-- A review of the literature on one of the most common and clinically significant zoonoses, leptospirosis, is presented. The article summarizes current information on the prevalence, epidemiology, etiopathogenesis and clinical features, diagnosis of leptospirosis infection over the past 10 years. Particular attention is paid to the characteristics of severe forms of the disease, integrated approaches to the treatment of the disease, correction of organ dysfunction and hemostasiological disorders.

Keywords: Leptospirosis, infection of the population, anthropogenic foci, serological groups.

Introduction

Despite advances in understanding many aspects of leptospirosis, they remain widespread and cause significant damage in many parts of the world. Along with the traditionally significant incidence of this infection in the population of endemic territories, the relevance of leptospirosis is steadily growing due to the growing popularity of extreme tourism, the growth of emigration of residents from developing countries, military operations, as well as emergency situations, including natural ones. According to the WHO, among the major outbreaks of infectious diseases registered in recent years, which affected tens of thousands of people, there were also outbreaks of leptospirosis. (1)

The causative agents of leptospirosis belong to the III group of pathogenicity, according to SP 1.3.2322-08 "Safety of working with microorganisms of III-IV groups

of pathogenicity (danger) and pathogens of parasitic diseases."

Pathogenic leptospira persist in environmental objects for a long time under certain conditions (optimum temperature 28-30 ° C, high humidity and pH 7.0-7.4), can cause massive epidemic outbreaks. The summer-autumn seasonality of the disease is associated with various agricultural activities, the collection of wild plants, hunting, fishing and outdoor activities in the territory of natural foci of leptospirosis. In economic (anthropurgic) foci, seasonality of incidence may not be traced. (2.3)

The main hosts (reservoirs) and sources of infection in nature are small mammals. In anthropurgic foci, this role is played by farm and domestic animals. (5)

The disease is characterized by a variety of clinical manifestations and symptoms, which creates difficulties in making a diagnosis, assessing the condition and predicting the outcome of the disease. The polymorphism of clinical manifestations depends on the characteristics of pathogenesis and the location of the pathogen in the body. The course of the disease varies from mild (subclinical) to severe forms, with acute renal failure, bleeding and jaundice, often leading to death.

Leptospirosis is a group of natural focal non-transmissible zoonoses similar but not identical in pathogenesis, epidemiology and clinical manifestations. Against the background of widespread distribution, on almost all continents of the globe, the highest incidence of people is noted in regions with a humid subtropical and tropical climate (Latin America, Southeast Asia). (6)

The causative agents of leptospirosis are spirochetes belonging to the species *Leptospira interrogans* of the genus *Leptospira*, which is part of the *Leptospiraceae* family of the order *Spirochaetales*. Pathogenic leptospira identified to date are assigned to 25 serogroups, 250 serovars and 20 taxonomic species.

Wild and domestic animals of many species can be classified as leptospira carriers. The main hosts (reservoirs) and sources of the infectious agent are rodents (grey voles, mice, rats and others) and insectivores (hedgehogs, shrews), in which the infection is asymptomatic, accompanied by the excretion of leptospira in the urine.

In anthropurgic foci, this role is played by domestic animals - dogs, pigs, cattle, sheep, less often goats, horses and reindeer, as well as caged fur animals - foxes, arctic foxes, coypu. In these mammals, the disease proceeds acutely, subacutely, or in the form of chronic asymptomatic leptospiron carriage; miscarriages (abortions) are possible during "pregnancy". (2)

A person is included in the infectious process through direct contact with the urine of infected animals - leptospira carriers or through contaminated environmental objects, mainly through water, soil and plants, sometimes food products. The following infection mechanisms have been established: contact and fecal-oral. It should be noted that the disease is not transmitted from person to person and a sick person is a "dead end" of the infection.

According to the WHO definition, leptospirosis is becoming increasingly important, especially in countries with a tropical and subtropical climate, and the territories of the countries of South and Southeast Asia are almost completely endemic. In addition, serious complications of the epidemic situation for leptospirosis are the consequences of natural emergencies. Fatal outcomes of the disease are observed with the development of severe complications (infectious toxic shock, acute renal failure, acute renal and hepatic failure, DIC, ARDS, pulmonary hemorrhage, etc.). In most developing countries endemic for leptospirosis, there are no surveillance activities and no programs aimed at preventing and reducing the

incidence. As a result, the true incidence rate is not known, and outbreaks are not controlled.

In the Republic of Uzbekistan, the registration of epidemic foci of leptospirosis is mainly associated with bathing in open water and drinking water infected with leptospira. In most cases, sporadic manifestations of the disease are observed.

The risk of infection being introduced into administrative territories of the Russian Federation that are safe for leptospirosis has increased significantly due to the popularity of recreation in the countries of the tropical and subtropical zones, tourism, sports and amateur fishing, windsurfing, rafting and other sports associated with contact with water. The groups of high occupational risk of infection with leptospirosis in economic foci include livestock breeders, workers of meat processing enterprises and slaughterhouses.

It is possible intralaboratory infection when working with animals used in research activities, with careless manipulations with cultures of virulent strains of leptospira.

Leptospirosis occupies one of the leading places among zoonoses in terms of the breadth of distribution of natural and economic foci, as well as the severity of the clinical course of the infection and the frequency of deaths. According to rough estimates by international experts, more than 100,000 people in the world fall ill with infections of this group every year. Relatively low rates of registered morbidity in most countries of the world, including Russia, as a rule, are due to the unsatisfactory state of differential clinical and laboratory diagnostics. For this reason, many authors, not only in developing, but also in economically developed countries, classify leptospirosis as a group of "neglected" infectious diseases [11].

The highest level of epidemic manifestation of leptospirosis foci is typical for countries in the subtropical and tropical climatic zones, where outbreaks periodically occur, covering hundreds and even thousands of people [15]. The probability of a sudden complication of the epidemiological situation increases many times in emergency situations (floods, earthquakes, etc.). One of the largest outbreaks in recent years (2158 cases, including 167 deaths) occurred in the Philippines (in Manila) shortly after two powerful typhoons and subsequent flooding in September-October 2009.

Often, sporadic cases or group outbreaks of leptospirosis occur during competitions related to water sports. An example is the "international" outbreak in Malaysia (on the island of Borneo) in 2000, when athletes from 27 countries of the world fell ill with a severe form of leptospirosis - participants in the all-around, which included canoeing [14].

In the past two decades, the risk of infection with leptospirosis has increased significantly due to the growing popularity of recreation in countries of the tropical and subtropical zones, tourism, sports and amateur fishing, windsurfing, kayaking, rafting and other sports associated with the risk of contact with water contaminated with secretions (urine) of leptospira-carrier animals. The latter gave reason to classify leptospirosis as a group of "recreational" zoonoses [10].

Leptospirosis continues to occupy one of the first places among zoonoses in terms of the severity of the clinical course and the frequency of deaths. A severe form of leptospirosis is a classic model of sepsis, for which multiple organ failure is an obligatory symptom [6, 7]. The trend of modern leptospirosis in Europe is the registration of sporadic cases with a high mortality rate of up to 55% [8-11].

The development of integration processes, the expansion of trade and economic cooperation, modern fast means of transporting food and feed have eliminated the

former geographical barriers to the removal of human and animal pathogens from endemic territories to countries where they are either absent or have a limited distribution. There are frequent cases of unintentional introduction of dangerous pathogens of zoonotic infections with imported farm animals, companion animals, in the legal and illegal trade in representatives of wild fauna, animal and plant products [1].

Leptospira are pathogens of the high risk group in terms of the likelihood of transboundary movement with representatives of the wild fauna, since more than 130 genera of animals can serve as their potential carriers [1, 13].

Confirmation of the reality of this threat is the report of occupational cases of infection with leptospirosis employees of a company engaged in the trade of wild animals in Japan. Flying squirrels brought from the USA (Miami, Florida) in 2005 turned out to be the source of the leptospira of the Grippotyphosa serogroup [12].

In the last three decades, in a number of European countries (in the UK, Italy, etc.), leptospirosis caused by pathogens of the Australis serogroup (serovar muenchen) has been recorded in pig populations. In 2002, for the first time in Russia, severe cases of this leptospirosis among people were diagnosed [5]. In connection with this alarming fact, it seems expedient to conduct research to identify natural and economic foci of leptospirosis (Australis muenchen) in our country, to assess their epidemiological and epizootic manifestations.

The ubiquitous distribution of leptospirosis in the world is due to a wide range of hosts of pathogenic leptospira and susceptible animal species, as well as a high degree of biodiversity of pathogens. To date, more than 250 serovars of pathogenic leptospira have been identified, assigned to 11 genome species.

World data on the incidence of humans and animals indicate the widespread distribution, as well as a pronounced epidemiological and epizootological manifestation (including in Russia) of infections, the causative agents of which belong to three genomic species of leptospira: *L. interrogans* - serovars *copenhageni*, *icterohaemorrhagiae*, *canicola* and *pomona*, *L. kirschneri* - *mozdok* and *grippotyphosa* and *L. borgpeterseni* - *tarassovi* and *hardjo*.

Of particular danger in relation to the threat of the spread of new pathogens outside endemic territories is a large group of exotic highly virulent leptospire (lai, huanuco and many others), whose antigens are not presented in diagnostic test systems and vaccine preparations.

The main hosts (reservoirs) and sources of infection are rodents and insectivores. In economic (anthropurgic) foci, this role is played by domestic animals - dogs, pigs, cattle, as well as caged fur animals - muskrats, nutrias, foxes, arctic foxes [Sanitary rules 3.1.7. 2835 -11 "Prevention of leptospirosis infection in humans", 17]. In mixed foci, the gray rat (*Rattus norvegicus*) is considered to be the main reservoir of infection. Pathogenic leptospire are characterized by host (host) specificity. In the Krasnodar Territory over the past 5 years there have been significant changes in the etiological structure of leptospirosis. The predominant role of *L. icterohaemorrhagiae* is gradually decreasing (from 90% in 2000 to 40.7% in 2016), and the share of *L. Sejroe* Mus 24 (up to 16.8%), *L. Tarassovi* (8-20%) is increasing. , *L. Grippotyphosa* (3.7 - 25%). The dominant carriers of *L. interrogans* in natural foci were 4 species of rodents: the field mouse (38.5-42.5%), the small Caucasian wood mouse, the Caucasian wood mouse, the bush vole, the role of the gray rat has significantly decreased. The infection is transmitted to humans through direct contact with the urine of infected animals or through environmental objects contaminated with the urine of leptospire-carrier animals (mainly through water, soil and plants, rarely food products) - a percutaneous infection mechanism. The main route of infection

should be considered water-contact, which does not apply to the fecal-oral transmission mechanism. Recently, leptospirosis has been classified as a so-called recreational zoonoses. The risk of contracting leptospirosis infection has increased significantly due to the popularity of recreation in countries of tropical and subtropical zones, tourism, sports and amateur fishing, windsurfing, rafting and other sports associated with contact with water.

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