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Etiologic characterization of new and re-emerging viral infections by the example of West Nile virus

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Abstract

This paper investigates etiologic characterization of new and re-emerging viral infections by the example of West Nile virus. Moreover, this paper analyses both methodological and theoretical sciences while taking into consideration characterization of new and re-emerging viral infections by the example of West Nile virus. It concludes with outcomes and shortcomings with major recommendations to the future research.

Keywords: Etiologic, viral, infections, virus, West Nile, Uzbekistan

Introduction

Improving the health system, the invention and the introduction of new methods of diagnosis, treatment and prevention of diseases, modernization epidemiological monitoring techniques, expanding the boundaries of epizootic studies and etiological decoding new and emerging infections including arbovirus is a priority of today's health ^[8].

Uzbekistan is an area with varied terrain, variety and large number of blood sucking vectors (mosquitoes, ticks, black flies, etc.) and their vertebrate hosts, mammals and birds, which may serve as reservoirs and vectors and viral pathogens of dangerous infections ^[10]. All this contributes to the formation of natural foci of viral diseases.

To date, Uzbekistan identified more than 20 types circulation arboviruses, some of them causes severe disease with high mortality. An example is the Crimean-Congo hemorrhagic fever, the natural foci of which are revealed in almost all landscape zones of provinces except for mountain areas ^[4].

If we consider the climatic and geographical conditions of the neighboring countries, then the circulation of many other pathogens of viral infections could be revealed with a high probability of identifying those types of viruses and as well as in our territory.

Theoretical background

In fact, the north-west area of the country (the Republic of Karakalpakstan and Khorezm province) lies on the migration route of birds (from East Africa through Kazakhstan to western Siberia, and from Ceylon, India and Afghanistan through the southeast regions of Uzbekistan (Surkhandarya and Kashkadarya provinces) to Eastern Siberia. There is possibility to appearance of Japanese encephalitis virus, West Nile fever (WNV), yellow fever, tick-borne rickettsial diseases, Omsk hemorrhagic fever and others in our regions which might cause severe infections in people with a high mortality rate. ^[2, 3].

There is a lot of information about the wide spread of the virus WNV in Central Asia, Kazakhstan, Tajikistan, Kyrgyzstan, the Caucasus and other CIS countries. ^[6]. This virus is characterized by high ecological plasticity, i.e. wide adaptability to different environmental conditions. The virus was isolated from the blood of patients with different diagnoses

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(acute respiratory infections, summer flu, catarrh of the upper respiratory tract, tonsillitis, bronchitis, pneumonia, myocarditis, meningitis, meningo-encefalitis, aseptic meningitis, and others.) As well as birds, mosquitoes, Ixodes and Argasides taken from farm animals or collected in various habitats. [7].

The main carriers of WNV are mosquitoes. In Uzbekistan, about 25 species of mosquitoes were found. They are common in all landscape zones: the plains, foothills and mountain. In the north-eastern regions of the Republic: Tashkent, Syrdarya and Ferghana Valley, the most of mosquitoes concentrated on the plain; in southern regions (Kashkadarya, Surkhandarya rprovinces)-in the foothills.

West Nile Virus (WNV) is a natural and focal arbovirus infection, which flows in the form of an acute febrile illness with symptoms of intoxication, headache and muscle aches, often with the development of serous meningitis and meningoencephalitis. Infection with human pathogen of West Nile occurs usually at bites of infected mosquitoes [16,17]. However, recently a transmissible infection method has described (mainly in the USA) many cases with the infection of patients with blood transfusion and organ transplant [18]. The clinical course of the infection caused by a virus WNV has been described previously in many sources as "quite mild febrile influenza-like illness" with a varied and non-specific symptoms. The authors argue, that the development of acute serous meningitis or meningoencephalitis is a complication of the disease and mortality from WNV was low. [19, 20].

Main part

The acute opposite reports (from 1996-1999) described that the outbreak in Romania, the United States and in Russia was characterized by a high proportion of meningitis and meningoencephalitis (> 50%). Thus, according to I.I. Vengerov [21], when an outbreak happened in Volgograd (in 1999) and in surrounding areas, the hospitals received 739 patients with the same type of symptoms like fever, headache, muscle aches, joint pain, severe weakness and CNS symptoms.

In general, the nature of intoxication syndrome of the WNV disease was significantly different in the literature descriptions: febrile period duration averaged over 8 days, in some cases up to 4 weeks. All patients had dominated central nervous system (CNS) symptoms like severe headache, diffuse character accompanied by nausea and vomiting, half of the patients was often noted dizziness, confusion, weakness, radicular pain, hypersthesia skin and 25% of patients had increased blood pressure, more than half - meningeal syndrome. Besides febrile (influenza-like) and meningeal forms of the disease, it was observed meningoencephalitic form of the disease which is characterized by severe, malignant course. 3-4 day illness against meningeal syndrome began to dominate encephalitic symptoms: confusion, agitation, stop, and in some cases coma; frequently observed seizures, muscle tremors, paresis of the lower limbs, at least - of the cranial nerves, nystagmus, impaired stem functions. 40 patients died during brain swelling phenomena and respiratory disorders, the mortality rate of the total patients was 5.4% and in patients with meningoencephalitis was 48%.

Significant differences were observed in the clinical picture during outbreaks caused by virus WNV in the United States [12, 13]. Thus, for example, if acute paralysis in 1999 occurred

mainly in elderly patients, in 2002 and 2003 (didn't understand). This symptom has been described in patients younger than 27 years. In addition, it was observed motor disturbances that are typical of Parkinson's disease: bradykinesia, myoclonus, tremor, mental, bruxism in West Nile infection. These symptoms generally were characterized by severe WNV, accompanied by acute encephalitis or muscle paralysis. Because of WNV infection, the following complications occurred: eye optic neuritis, chorioretinitis, retinal hemorrhage, vitreous inflammation [9].

I.I Protas and SO Velgin, The peculiarities of neurological manifestations of West Nile fever during the epidemic in Europe and the US, have also come to the conclusion that the clinic, course and outcomes of infection caused by a virus WNV undergone profound qualitative changes in the direction of the apparent rise of the nervous system (change properly). Characteristics of the infection were the rapid development of fever of brain disorders with intellectual-mental decline, delirium, and coma convulsions. First, it was described like polio paralysis, which was often developed in elderly patients [19, 20]. Neurotropic virus WNV was announced in 1956 by Smitburn [23], who first isolated it from the blood of the sick woman in Uganda. In the academic reference "Infectious disease in humans," edited by V.M. Zhdanov [2, 3] indicated that the disease was caused by a virus Smitburn, It is called "viral West Nile encephalitis." The summary of product characteristics is reported that "the disease is the presence of fever, brain symptoms (loss of consciousness, impaired reflexes, paralysis) and is reminiscent of the clinical picture of other mosquito-borne infections." These differences in the name of the disease appear to be related to the fact that some researchers observed light febrile diseases, and others - with severe cases with central nervous system (CNS). The pioneers of the pathogen have not been determined by the name of the disease, and the virus has been isolated by patients with mild fever [16, 18] and by a healthy child. [17] Therefore, the foregoing was the basis for the VTS (what does VTS stand for?) called the disease "viral West Nile encephalitis," as previously proposed by V.M. Zhdanov [19]. For the diagnosis of West Nile infection widely used serological tests, especially ELISA [15]. The presence of the virus titer shows the increase in the study of paired sera taken with an interval of 7-10 days, or the detection of IgM class antibodies. In endemic areas, class IgG antibody can be detected in a substantial proportion of the population by isolation of the virus from the blood into the cell culture or isolation by intracerebral infected of newborn albino mice - [14, 21]. And the same virology methods may be used in the diagnosis of a disease caused by a virus WNV. The most effective method, particularly for early diagnosis, is the polymerase chain reaction (PCR) allowing for detecting viral RNA in the blood and cerebrospinal fluid.

Transmission mechanism of hereditary information in many RNA viruses including WNV, has a significant variability of the genetic structure, leading to virus mutations which cause changes of the nature of the virulence potential and course of the disease [5, 7]. Very often the etiological decoding of arbovirus infections difficult tremendous antigenic diversity of pathogens, the necessity of a specific laboratory test to confirm the diagnosis (please change the language accordingly, didn't understand).

Discussion

A disease pattern might be observed during the recent outbreaks, associated with a change in the antigenicity of the virus and the sharp increase in the capacity of its virulence. Just the virulence of the virus may depend on the strain belonging to a particular genotype of the WNV. ^[1]

According to the literature, it is known genotype 4 Z.N. By genotype I virus WNV are from North, West and Central Africa, Southern and Eastern Europe, America and Kundzhin virus; the II genotype - virus isolates from West, Central and East Africa and Madagascar; for genotype III - Indian isolate MN strain of virus; to genotype IV - virus strain isolated in Russia. ^[15, 17, 18, 19, 22, 23]. (Please have a look again).

First time, in Uzbekistan, WNV virus was discovered in 1981 from the cerebrospinal fluid of patients with a diagnosis of "aseptic meningitis", living in the Samarkand region.

Conclusion

Over the past five years of research of the scientists – virologists, the virus WNV circulation was identified in the territory of Uzbekistan; antibodies to the virus in the blood serum of people who identified antigen in mosquitoes, gnats and ticks isolated virus strains of WNV from birds and sick people (please change appropriately). Molecular genetic studies of isolated strains are planned to establish the pathogen genotypes, circulating in the area.

As a result of study, the immune layer among the healthy population was found non-uniform distribution of antibodies to the WNV in Tashkent province region at 13.3%, in Surkhandarya - to 9.4%, Samarkand region from 5.9% to 9.4%.

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