Hepatitis A and E: surveillance and epidemiological situation in the Russian Federation.

Mikhail Mikhaylov

Mechnikov Research Institute for Vaccines and Sera, Russian Medical Academy of Continuous Professional Education, Moscow

October 25 2018
State Sanitary and Epidemiological Surveillance of Hepatitis A in Russia

The purpose of surveillance: assessment of the epidemiological situation and trends in the development of the epidemic process and the timely adoption of effective management decisions with the development and implementation of adequate sanitary and anti-epidemic (preventive) measures to prevent the occurrence and spread of CAA.

Tasks of hepatitis A surveillance:
- constant and objective assessment of the extent and nature of the prevalence, and socio-economic significance of the infection;
- Identification of the trends in the epidemic process;
- identification of territories and institutions with a high incidence and risk of infection;
- identification of the contingents most at risk of developing the disease;
- identifying the causes and conditions that determine the level and structure of HAV incidence in the territory;
- monitoring and evaluating the effectiveness of ongoing preventive and anti-epidemic measures for its optimization;
- development of epidemiological forecasts
Hepatitis A incidence rates in Russian Federation in 1977-2016

Factors contributing to decrease in hepatitis A incidence:

- Socio-economic changes since 1990s (↓ birthrate, ↓ number of pioneer / sports camps, ↓ preschool institutions, ↓ student construction brigades)
- Improving sanitary and hygienic living conditions (consumption of bottled water, etc.)
Hepatitis A: shift in epidemiology

- Decrease of HAV circulation in children
- Improving hygiene and sanitation
- Increase in the number of susceptible teenagers and young adults
- Increase in the number of non immune adults
- Increase in the number of symptomatic and severe cases of hepatitis A

Hepatitis A outbreaks in Russian Federation

Outbreaks associated with HAV genotype IA
Outbreaks associated with HAV genotype IIIA

In 2017 the number of hepatitis A outbreaks increased from 22 in 2015-2016 to 28, with 19.8% increase in total number of affected persons.
The proportion of children under 17 years among all reported cases of hepatitis A has decreased in the last 6 years from 46.9% to 25.0%.
State report "On the state of sanitary and epidemiological welfare of the population in the Russian Federation in 2017"
Incidence of hepatitis A in Tyva Republic before (2012) and after implementation of vaccination in children (2013 - 2016)

Coverage rate in children of 3 - 8 y.o. by 31.12.2012: 87.4% (about 40,000 children)

There was a 43-fold decrease in the incidence of hepatitis A among the entire population of the Republic and a 75-fold decrease among children in 2014 compared to 2012 (before vaccination).
Hepatitis A outbreak in USA in 2017-2018 (lesson for the world and the Russian Federation)

• As of October 1, 2018, the US Centers for Disease Control and Prevention (CDC) reports on increase in hepatitis A incidence since August 2018 in the states of Kentucky and West Virginia among homeless and drug users.
• About 50 new cases each week. On September 28, 2018 total 1851 cases were registered in Kentucky and 1,395 cases in West Virginia.

In addition, the increase in incidence was registered in the states of California (San Diego), Utah, Colorado and Wyoming.

• Despite vaccination against hepatitis A in the US, the risk of outbreaks remains;
• Homeless and drug users are at increased risk of HAV infection;
• The analysis of hepatitis A outbreaks in the United States suggests the possibility of such situations in the Russian Federation, which determines the need for universal (mass) vaccination against hepatitis A among the population of the Russian Federation and especially in risk groups, including homeless;
• Interdisciplinary research is needed to study the spread of hepatitis A in various population groups.
12 August 1981: oral selfinfection with a combined extract containing stool samples from 9 patients with a second episode of hepatitis
Hepatitis E incidence in Russia

Notifiable disease in RF since 2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>92</td>
</tr>
<tr>
<td>2014</td>
<td>110</td>
</tr>
<tr>
<td>2015</td>
<td>96</td>
</tr>
<tr>
<td>2016</td>
<td>113</td>
</tr>
<tr>
<td>2017</td>
<td>158</td>
</tr>
</tbody>
</table>

0.11 0/0000 in RF
0.26 0/0000 in CFO

Hepatitis E incidence, per 100,000
Incidence rates of hepatitis A and hepatitis E in Belgorod region in 2010-2017

Incidence, per 100,000 population

- Hepatitis A
- Hepatitis E

2010: 0.6, 0.2
2011: 2.2, 5.9
2012: 1.3, 4.3
2013: 2.5, 2.2
2014: 1.1, 3
2015: 1.8, 0.7
2016: 0.4, 5.2
2017: 0.52, 3.94
Anti-HEV IgG prevalence in general population in Russian Federation

<table>
<thead>
<tr>
<th>Region</th>
<th>&lt; 20</th>
<th>20-60</th>
<th>&gt; 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow region</td>
<td>3.6</td>
<td>5.7</td>
<td>28.2</td>
</tr>
<tr>
<td>Rostov region</td>
<td>1.6</td>
<td>4.4</td>
<td>25.3</td>
</tr>
<tr>
<td>Sverdlovsk region</td>
<td>0.6</td>
<td>3.8</td>
<td>8.3</td>
</tr>
<tr>
<td>Yakutia</td>
<td>0.4</td>
<td>1.9</td>
<td>11.3</td>
</tr>
<tr>
<td>Tyva</td>
<td>1</td>
<td>7.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Khabarovsk region</td>
<td>0.8</td>
<td>2.3</td>
<td>8.1</td>
</tr>
</tbody>
</table>

n = ca. 6000 persons
Sources and routes of transmission of hepatitis E
Hepatitis E outbreak in Kovrov (Vladimir region) in 2009

Branches highlighted in red have confidence >90%
HEV prevalence in pigs

<table>
<thead>
<tr>
<th>Region</th>
<th>HEV RNA, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vladimir region</td>
<td>60.5%</td>
</tr>
<tr>
<td>Sverdlovsk region</td>
<td>12.8%</td>
</tr>
<tr>
<td>Saratov region</td>
<td>28.4%</td>
</tr>
<tr>
<td>Kaliningrad region</td>
<td>12.9%</td>
</tr>
<tr>
<td>Arkhangelsk region</td>
<td>20.4%</td>
</tr>
<tr>
<td>Khabarovsk region</td>
<td>8.8%</td>
</tr>
</tbody>
</table>

Age-specific HEV RNA prevalence in pigs

<table>
<thead>
<tr>
<th>Age, months</th>
<th>HEV RNA, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69.5%</td>
</tr>
<tr>
<td>2</td>
<td>50.0%</td>
</tr>
<tr>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>4, 5, &gt;5</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Phylogenetic tree for HEV sequences isolated in Belgorod region from pigs, patients and the sewage from pig farms.

Sequences from sewage are indicated in red, sequences from patients in green, sequences from swine in blue. Branches highlighted in red have confidence >90%.
Stable circulation of a single HEV strain in the pig farm in 2012-2016
Case of hepatitis E caused by HEV GT4 in patient who traveled to Corsica

The patient F (23 years old), lived and worked in Moscow. From June to August 2012, he periodically lived in Corsica (10-14 days a month), where the family rented a house for the summer by the sea. He ate a variety of food, including tasting meat products (smoked and blood sausages) in various private village shops. He ate not only homemade food, but also in small restaurants, ate poorly roasted meat, seafood, including oysters, sushi and rolls. Drank mostly bottled water. Until June 2012, did not leave Moscow for a year.

No operations, donation, parenteral manipulations in anamnesis, did not visit the dentist for more than 6 months. Had no contact with feverish, icteric patients. All family members were healthy.
Importation of HEV GT 4 in cynomolgus monkeys (*Macaca fascicularis*) from Vietnam

Total 79 cynomolgus monkeys were imported to Adler primate research center from Vietnam in 2017.

Anti-HEV IgM: 43.2%; anti-HEV IgG: 56.8% animals.

HEV RNA in feces had 7 (8.9%) animals.
State sanitary and epidemiological surveillance of hepatitis E in the Russian Federation (the period of formation)

- **The purpose of surveillance**: assessment of the epidemiological situation and trends in the epidemic process and the timely adoption of effective management decisions with the development and implementation of adequate sanitary and anti-epidemic (preventive) measures to prevent the occurrence and spread of HEV.

Distinctive features of the sanitary and epidemiological surveillance of hepatitis E, compared to hepatitis A, are:

- Low public awareness of the significance and the threat of hepatitis E;
- Lack of vaccine against this infection;
- Interventions for disruption of HEV transmission routes associated with infected pigs as the main source of the virus.
Thank you for your attention

Hepatitis E
PDB: 2ZTN

VMD image: JYS (2010)