African swine fever (ASF) epidemic situation in the Russian Federation

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African swine fever (ASF) (lat. *Pestis africana suum*) – generalized highly contagious viral disease of swine characterized by fever, blue skin, extensive hemorrhages. It is in the OIE list of diseases subject to obligatory notification.

(ASF does not affect humans)
The disease is known from the beginning of the XX-th century, from first attempts to introduce swine stud breeds into African colonial countries. The substantial contribution to ASF study was made by R. Montgomery.
Hosts of African swine fever virus

Warthog

Bush Pig

Tick

Domestic Pig

Ornithodoros moubata
Disease Agent

- DNA – virus is the member of Asfarviridae family, Asfivirus genus.
Genotypic diversity of ASF viruses and their geographic range
ASF nosoarea at the beginning of the 21-st century

Map showing ASF outbreaks (2005-2008) in Africa. The map legend indicates:
- Red: Cases reported
- Green: No case reported
- Grey: No information

Epidemiological status:
- Enzootic
- Epizootic
- Epi-enzootic
ASF introductions (1957; 2007)

Genotype II
(Mozambique – Madagascar – Georgia)

Serotype 8
(highly virulent)
Georgia, 2007
November 2007
First case
Chechen Republic
Wild boars
(Shatoyskoye gorge)

May 2008
First case
Domestic swine
Republic of North Ossetia
ASF spread

• 45 new outbreaks were registered in 2008 (37 – among domestic swine, 8 – among wild boars), 54 outbreaks were registered in 2009 (35 – among domestic swine, 19 – among wild boars), 77 new outbreaks were diagnosed in 2010 (58 – among domestic swine, 19 – among wild boars) including outbreaks in previously ASF-free territories
2010 год, IV квартал
Распространение АЧС по территории Российской Федерации (N = 177)
ASF spread from Georgia to Armenia, Azerbaijan, Russia and Iran
At present ASF is the most important transboundary infection with disastrous potential, one of the most serious epizootological problems due to:

✓ Extremely great direct losses (high lethality among susceptible animals);

✓ Ability to penetrate and spread in any region of the world with pig population;

✓ Absence of specific prevention tools.
ASF spread

- 41 outbreaks were registered in 2011 (January – October) (31 – among domestic swine, 10 – among wild boars) including cases of infectious agent introduction into Arkhangelsk (2), Leningrad (1), Murmansk (1), Nizhny-Novgorod (2), Tver (9) and Kursk (1) Regions.
9 affected regions outside the endemic zone

- места вспышек АЧС
- 100 км зона риска
ASF spread

• In 2012 the threatening situation happened in the Tver Region where ASF outbreaks were regularly registered among wild boars. Illegal burial sites were detected in the territory of the region where died from ASF swine were buried.

• Besides, ASF emerged in Ukraine.
African swine fever in 2012
(N = 394, N_{2012} = 111)

2012
6 new territories + Ukraine

Условные обозначения:
- вспышки АЧС среди диких кабанов (N = 125)
- вспышки АЧС среди домашних свиней (N = 251)
- инфицированные объекты (N = 18)
- 100-км зона риска
ASF in RF Subjects in 2012

Legend
- ASF-affected Subjects in 2012
- ASF outbreaks
<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<td></td>
<td>2</td>
<td>62</td>
<td>73</td>
<td>84</td>
<td>62</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>64</td>
<td>137</td>
<td>221</td>
<td>283</td>
<td>394</td>
</tr>
</tbody>
</table>

(01/10/2012)

Условные обозначения:
- вспышки АЧС среди диких кабанов (N = 113)
- вспышки АЧС среди домашних свиней (N = 235)
- инфицированные объекты (N = 13)
- 100-км зона риска
General dynamics of ASF course and a trend as of 01.01.2013

Общее неблагополучие АЧС в РФ с 2007 по 2013 гг.
(линейный тренд)
Polynomial trends of ASF among domestic swine and wild boars as of 01.01.2013
In 2013 ASF continued to spread. ASF agent genetic material was detected in both wild boars and domestic swine in Central and North Caucasian Federal Districts.

• ASF was diagnosed in the Republic of Belarus.
African swine fever epidemic situation in Western Europe in 2007 - 2013
### ASF endemic situation in wild boars in the Russian Federation in 2007 - 2013

*N = 199 as of 15.10.2013*

<table>
<thead>
<tr>
<th>Year</th>
<th>2007 - 08</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<td>Cumulative number of cases</td>
<td>64</td>
<td>137</td>
<td>221</td>
<td>283</td>
<td>404</td>
<td>557</td>
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<tr>
<td>Number of cases per year</td>
<td>64</td>
<td>73</td>
<td>84</td>
<td>62</td>
<td>121</td>
<td>153</td>
</tr>
<tr>
<td>of which in wild boars</td>
<td>21</td>
<td>26</td>
<td>22</td>
<td>14</td>
<td>45</td>
<td>71</td>
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<tr>
<td>% of wild boar cases</td>
<td>32</td>
<td>35</td>
<td>25</td>
<td>23</td>
<td>37</td>
<td>46</td>
</tr>
</tbody>
</table>

#### ASF outbreaks:
- Blue circles: in wild boars
- Black circles: all outbreaks in 2007 - 2013

*European part of the RF*

![Map of ASF outbreaks in Russia](image-url)
ASF epidemic situation in the endemic areas* of the Russian Federation

'Northern' endemic area
The first reported case - April 2011
Total 164 cases from 04 2011 to 10 2013.
Of which: 52 (32%) cases in domestic pigs;
106 (65%) cases in wild boars
6 (3%) affected sites

Regions: Tverskaya obl., Novgorodskaya obl., Smolenskaya obl.,
Yaroslavskaya obl., Moskovskaya obl., Tulskaya obl.,
Vladimirskaya obl., Pskovskaya obl.

Out-of-endemic 'remote' cases
The first reported case - July 2008
Total 24 cases from 07 2008 to 10 2013.
Of which: 17 (71%) cases in domestic pigs;
1 (4%) cases in wild boars;
6 (25%) - affected sites

Regions: Orenburgskaya obl., Saratovskaya obl.,
Voronezhskaya obl., Kurskaya obl., Tulskaya obl.,
Nizhegorodskaya obl., R.Tatarstan,
Ivanovskaya obl., R.Kareliya,
Arkhangelskaya obl., Murmanskaya obl.

'Southern' endemic area
The first reported case - November 2007
Total 369 cases from 11 2007 to 10 2013.
Of which: 261 (71%) cases in domestic pigs;
92 (25%) cases in wild boars;
16 (4%) affected sites

Regions: R.Chechnya, R.Ingushetia, R.Dagestan,
R. Karachaevo-Cherkesiya, R. North Ossetia,
R.Kabardino-Balkaria, R.Adygeya, R.Kalmykiya
Stavropolsky kraj, Krasnodarsky kraj,
Astrakhanskaya obl., Volgogradskaya obl.,
Rostovskaya obl.

*the endemic areas' borders are defined by means of Standard Distance tool (ArcGIS, Esri)
ASF spread tendency

- Areas where the ASF was first reported in 2013
- Areas where the ASF was reported in 2007 - 2013
- Areas where the ASF was reported in 2007 - 2012
- ASF free areas
ASF dynamics in 2007-2012 (N=349)
Shortcomings of ASF eradication in the RF

1. Violation of veterinary and sanitary rules in pork production, animal movements, sale of products.
2. Time periods for measures aimed at depopulation of susceptible animals in affected areas are often extended (second zone under threat – 100-150-km zone around an outbreak).
Shortcomings of ASF eradication in the RF

3. The anthropogenic mechanism is an important factor of ASF spread.

4. The practice of garbage feeding contributes to the disease spread.

5. The big population of wild boars and their possible contacts with domestic swine under conditions of open-type management of domestic swine.
Measures applied for ASF eradication in Russia
ASF prevention and control

Creation of awareness among general public and education

Improvement of biosafety on pig farms

Surveillance: owners, slaughter-house, veterinary inspections, laboratory network
ASF diagnostic investigations in the RF in 2008-2012 (ths)

Tested (ths) | Positive samples
---|---
2008 | 1,3
2009 | 27,7
2010 | 128,5
2011 | 137,1
2012 | 190

Tested (ths) | Positive samples
---|---
2008 | 506
2009 | 66
2010 | 266
2011 | 66
2012 | 190
Major measures for ASF outbreak eradication

- **Quarantine** (prohibition on export of swine and killing products – 6 months)
- **Zoning** (outbreak, 1 and 2 zones under threat)
- **Stamping out** (depopulation of all swine in an outbreak and zone 1, cleaning and 3-fold disinfection in an outbreak)
- **Surveillance** (for animal health in zone 2)
ASF virus transmission

• Direct virus transmission from affected to healthy animals.
• ASF virus transmission through infected garbage feeding.
• ASF virus transmission through transport facilities, equipment, clothes, etc.
• The role of biological vectors – ticks Ornithodoros – has not been established.
Susceptible animals in the RF

• Domestic swine

• Wild boars
ASF emergence in the territory of Russia
ASF virus cycle of infection

- Alimentary infection → tonsils → local lymph nodes → viremia

- Virus is shed with secretions, excretions, blood 2 days before clinical presentations and animal death.

- The level of ASF contagiousness and mortality among domestic swine in primary outbreaks comes to 100%.
Virulence of isolates of ASF virus circulating in Russia (2007-2010)

Incubation period - 4.3 (3.9-4.0) days
Infectious period - 6.8 (5-8.6) days
Viremia, 5.5-7.0 lg HAU/50
Detection of antibody to ASF virus – no
• ASF clinical presentation
Incubation period –
   at an average 3-7 days.

✓ In cases of oro-nasal infection even by small virus doses (10-100 HAU) fever and lymphopenia emerge in 48-72 hours.

Virus excretion happens before fever onset!
Sick swine with fever and hemorrhagies
ACUTE DISEASE
(highly virulent virus):

- fever (40.5-42° C), anorexia, atonia, cyanosis of mucous membranes;
- incoordinated movements in 24-48 hours before death;
- increase in pulse frequency and respiration rate;
- vomiting, diarrhea (sometimes bloody diarrhea), conjunctivitis;
- early leucopenia and thrombocytopenia (48-72 hours);
- skin congestion (in white swine)
- ventral surface of thoracic cage and abdomen, tail, hind legs
• abortions in pregnant swine

• death in 6-13 days in 100% of domestic swine
ASF-killed wild boars
ASF pathoanatomical findings
Acute disease:

✓ severely enlarged spleen. The color is from dark red to black;
✓ lymph-node hyperplasia;
✓ kidney affection.
Fibrinous exudate in abdominal cavity
Spleen
Spleen
ASF-affected spleen
Hemorrhagic lymphadenitis in case of ASF
Pharyngeal lymph nodes
Kidney
ASF-affected kidney
ASF-affected kidney
Differential diagnosis

The following should be excluded:

• classical swine fever;
• pasteurellosis;
• porcine reproductive and respiratory syndrome;
• intoxications.
Laboratory testing is obligatory

- In case of ASF laboratory confirmation the following OIE recommended methods are used:
- Fluorescent antibody method;
- Virus isolation in cell culture;
- Bioassay in swine in accredited laboratories.
- RT-PCR is widely used for detection of ASF virus genetic material.
Materials for laboratory testing

- Spleen pieces;
- Lymph nodes;
- Blood;
- Tubular bone (often from wild boar carcasses)
Measures aimed at ASF eradication are applied in conformity with approved rules
VILEN DANK!