EPIDEMIOLGY OF ASF IN WILD BOAR

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Tracing the origin

Georgia
June 2007
ASF: 0-70 km/year since 2007
**Few certainties**

Wild boar CAN ACT AS the true epidemiological reservoir of the virus;

The virus is maintained by the wild boars independently from the infection in domestic pigs and ticks

Infected Wild boar contaminate the environment making more likely secondary outbreaks in domestic pigs (non commercial and commercial farms)

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**How the virus spreads**

Direct e contacts (nose to nose)

Contaminated environment (infected material)

Feeding infected wild boar carcasses
Virus prevalence in infected wild boar population: 1-4.5%
Sero-prevalence in hunted WB: 0.5-2%
Incubation 3-5 days
Lethality 90-95%
70-80% found dead wild boar are virus positive
≈ 30-50 km/year is the average speed, but the virus lasts also in old infected areas
The virus spreads through the geographical continuity of the wild boar population RATHER THAN of wild boar migration
Higher prevalence in summer: new born animals, insects? Lower prevalence in winter: virus survives in carcasses Increasing prevalence: rutting period?

**EPIDEMIOLOGICAL ROLE PLAYED BY INFECTED CARCASSES AND INSECTS (NO TICKS)**

**Maggots** could increase contacts between wild boar and infected carcasses ut they have been never positive to the virus (only DNA presence but no virus): enhanced summer transmission

**Scavenging insects**: long attraction for wild boar, increased probability of direct contact with infected carcasses

**Carcasses**: virus maintenance in the environment; direct transmission to the susceptible animals
A directly transmitted virus which transmission is complicated by infected maggots, insects, and carcasses.
+ 19 wild boar approaches without contact

ASF epidemiology: the general picture

1) The virus is introduced by neighbouring infected wild boar;

2) The virus spread into the local wild boar population;

3) Infected carcasses play the role of virus maintenance in the environment even at a very low wild boar density;

4) The virus spread geographically: 30-50 km/year;

5) Due to human mistakes the virus is likely to be transported to domestic pigs or and to distant areas where the local cycle starts again in the local wild boar populations;

This pattern could even be without end!!!!
RISK OF SPREAD AFTER INTRODUCTION OF THE VIRUS

Delayed diagnosis
Wild boar population size and density
Forest connectivity
Inappropriate hunting methodologies
Lack of biosecurity measures applied during hunting
Infected wild boar carcasses available for healthy wild boars
Poaching

Geographical continuity

180 km
60 km
4 different groups of wild boar overlapping. ASF spreads for geographical contiguity.

Wild boar movements: Home range: 7 km²
Hunting management

Winter feeding increases densities

\[ y = 0.414 + 0.033x \]
Hunting and wild boar movement

- Drive hunting with dogs: increase of range size during the hunting season

<table>
<thead>
<tr>
<th>Season</th>
<th>100% MCP</th>
<th>95% kernel</th>
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<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Q1-Q3</td>
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<tr>
<td>Pre-hunting</td>
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<td>99</td>
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<tr>
<td>Hunting</td>
<td>428</td>
<td>544</td>
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<tr>
<td>Post-hunting</td>
<td>199</td>
<td>253</td>
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</table>

Home range displacements during the hunting season (up to 15 km)

Wild boar long distance movements

- Escaping hunting
- Nighttime
- Future farrowing area

FAO data on FMD in wild boars
LACK OF BIOSECURITY DURING HUNTING

ASF in wild boar (26.10.2016)

Inappropriate hunting
Lack of biosecurity during hunting

Carcasses removal and wild boar density

<table>
<thead>
<tr>
<th></th>
<th>2016 (26.10.)</th>
<th>2015</th>
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<tr>
<td></td>
<td>893</td>
<td>1048</td>
</tr>
<tr>
<td>Cases</td>
<td></td>
<td></td>
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<tr>
<td>Hunted</td>
<td>447</td>
<td>422</td>
</tr>
<tr>
<td>Found dead</td>
<td>446</td>
<td>626</td>
</tr>
</tbody>
</table>
How many wild boars?

DENSITY DEPENDENT SPREAD

The number of NEW INFECTED wild boar is proportional to the wild boar population size

The duration of the epidemic is proportional to the wild boar population size
Poland: tendency to spread within areas with wild boar density > 1 individual/km²

2014 – 30 cases  2015 – 53 cases  2016 – 28 cases

Density of wild boars (individuals per 10 km² of hunting ground) in hunting districts by hunters estimations (census) in spring 2016.
Can we define the threshold density?

The threshold density (nt) is that wild boar density at which an infectious wild boar does not encounter any susceptible wild boar in due time to spread the infection

Duration of infectiousness
Density/availability of susceptible hosts

If the wild boar population size is decreased till a certain density, the infection fade out through a density dependent mechanism

NO WILD BOARS = NO DISEASE

NO WILD BOARS = NO DISEASE
CLASSICAL SWINE FEVER in WILD BOAR

\[ \ln(\text{Population size}) \]

R Sq Linear = 0.935

1 year persistence

1000 wild boars

Density dependence of ASF

Duration (weeks)

\[ \ln(\text{Epidemic Persistence in Months}) \]

Wild boar density
Apparently: not a density dependent spread

ASF IN WILD BOAR

A density dependent transmission during summer-autumn (new born and adult animals)….insects?

Virus survival during winter with few (or many) infected carcasses according to the local ecological situation

A mixed transmission: density dependent and frequency dependent => NO THRESHOLD
The question is:

Which is the wild boar density that prevent the contact between a susceptible wild boar with an infected carcass?

An ASF virus will overwinter in an infected carcass……3-4 months…and the virus will appear again during the late spring in alive susceptible individuals.
ASF in not a truly density dependent infection. The final tail of the infection is determined by carcasses.

**Prevalence**

- **Density dependent transmission**
- **Density INDEPENDENT transmission**
- **NO THRESHOLD**

PRACTICALLY

ASF in wild boar eradication is PROBABILISTIC EVENT (stochastic) NOT a DETERMINISTIC one;

Eradication probability increases when: **wild boar population** size is reduced (as much as possible); **carcasses** are safely disposed (as much as possible); **hunting** is carried out under **bio-security**
ASF: THE VIRUS AND THE ENVIRONMENT

Since the infection is not entirely transmitted through density dependent mechanism we have to shift to

The reduction of the environmental contamination of the virus

The problem then is not purely addressed in the mechanistic reduction of the wild boar density but in reducing the viral load of the environment

Standing Group of Experts on African swine fever in the Baltic and Eastern Europe region under the GF-TADs umbrella

SGE ASF3: Moscow, Russia, 15-16 March 2016

Wild boar population reduction should be considered, in combination with other control measures, within the framework of a wild boar management strategy aimed at reducing ASF virus contamination of the environment.
TAKE AT HOME MESSAGE

1. In ASF epidemiology, infected carcasses maintains the virus in the environment for a very long time;
2. Due to the presence of infected carcasses, there is no a minimum number of wild boar at which the virus fade out;
3. A very low number of wild boars together with infected carcasses can maintain the virus in the forest
4. Improper hunting techniques together lack of biosecurity during hunting are the most relevant factors enabling the long distance spread (jumps) of ASF virus in wild boars.

THANKS FOR THE ATTENTION

QUESTIONS, COMMENTS?