"When Lithuania began fortifying its border with Belarus in July 2013, the fear wasn’t soldiers or tanks, but an invasion of a different kind: African Swine Fever". Erik Stokstad, Science, Dec 20, 2017
African Swine Fever (ASF)

Source: Callaway, Nature 2012

Source: C. Netherton/OIE

ASF: THE ”EBOLA” OF SUIDS

• Hemorrhagic disease of suids
• Devastating for the pig production and industry
• Economic loss:
  - eradication
  - trade

Carcasses of swine infected with ASFV culled and burned, Stavropol, Russia, 2009.
Photo: Xinhua/Reuters
**ASF: SOCIO-ECONOMIC IMPACT**

- Denmark: pork exports were worth $4.8 billion 2016 (19% of food and agricultural exports)*

- Estonia: 22,000 pigs slaughtered in 2015; pork prices collapsed, more than a third of pig farms went out of business. Nearly all backyard farms gave up their pigs*

* Ref: Science, Dec 20th 2017, E. Stokhed

**HOSTS**

- Exclusively infects suids and argasid ticks, genus *Ornithodoros*

- *Suidae* Fam. In domestic pigs, wild boar and hybrids, feral pigs

Domestic pig-wild boar cross (photo Wikipedia)
**ASF-VIRUS**

- *Asfivirus*, large, complex, enveloped DNA virus
- Genome encoding > 160 viral proteins
- 22 different genotypes with different virulence
- No vaccines
- Europe: genotypes I (Sardinia) and II (Eastern Europe)

Source photo: Univ. Illinois

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**ASF-VIRUS**

- Can survive for long periods in a protein environment
- Highly resistant in contaminated products: 1000 days in frozen meat
- Viable in undercooked pork products

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*Source photo: SVA*
**ASFV TRANSMISSION: DIRECT AND INDIRECT**

- In urine, saliva, feces, semen, etc
- In meat/meat products, trucks, equipment, boots, ticks
- In **blood**: very high virus titres
- Blood: hunting, necropsies, carcasses, vet equipment

- Low infectious dose

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**ASF ACUTE CLINICAL SIGNS**

- Many not specific and easily confused with other conditions
- Possible death without specific signs of haemorrhage

- Fever (40-42°C), lethargy
- Diarrhoea, vomiting
- Loss of appetite
- Haemorrhage
  - Skin redness and cyanotic areas (tip of ears, distal limbs, tail, perianal area, chest and abdomen)

Courtesy of Linda Dixon, acknowledgement: The Pirbright Institute, Surrey, UK
ASF ACUTE LETHAL FORMS: HAEMORRHAGIC LESIONS (PETECHIAE, EPISTAXIS)

Mandibular lymph nodes

Kidney (petechiae)

Stomach

S. Blome et al. / Virus Research 173 (2013) 122–130

EMERGENCE OF ASF IN EURASIA

Emerged in Eurasia (Georgia) in 2007, spread to:

- Armenia
- Russia
- Iran
- Azerbaijan
- Ukraine
- Belarus

Port of Poti, Georgia
EMERGENCE OF ASF IN EURASIA

- In Russia persisted, continues to spread into new areas, endemic in most of the South
- The Low Biosecurity sector remains the main risk factor:
  - disease introduction
  - endemicity
  - Key: swill-feeding of infected pork

Source: jordaneshay.files.wordpress

INCURSION OF ASF INTO EASTERN EUROPE

Several introductions of the virus from Russia and Belarus, causing clusters of disease.

Incursion into Eastern Europe

Spread mainly in the wild boar
CLUSTERING OF ASF NOTIFICATIONS: TRANSBOUNDARY SPREAD OF ASFV VIA CONNECTED WILD BOAR SUB-POPULATIONS

- 75% located less than 13 km from the border with Belarus and the Russian Federation
- Hotspots of notification near the border

ASF IN EASTERN EUROPE

6 EU COUNTRIES:

- Lithuania: January 2014
- Poland: February 2014
- Latvia: June 2014
- Estonia: September 2014
- Czech Republic: June 2017
- Romania: July 2017

LOCAL EPIDEMIC IN EASTERN EUROPE

• Local expansion in wild boar population, independently of outbreaks in domestic pigs.

• Short-distance spread of ASFV (1-2 km/week): direct contact between infected animals (wild boar)

• Sudden long-distance spread: human involvement

ASF-VIRUS IN EASTERN EUROPE

• Only one ASFV genotype: p72 genotype II

• 100% homology with the virus strains that circulated in Belarus and Russia

•Susceptibility to ASFV, level of viral excretion and clinical signs are similar for wild boar, feral and domestic pigs
ASF-VIRUS IN EASTERN EUROPE

- Highly virulent, acute form of ASF
- Mortality 94.5–100% in wild and domestic pigs, in a short time (2-3 weeks)
- Most animals die prior to development of antibodies
- Few animals develop antibodies and survive
- Low contagiousness

Mecanisms of circulation of ASFV in wild boar?

OCCURRENCE OF ASF IN EUROPE

Acknowledgement:
THE IMPORTANCE OF PASSIVE SURVEILLANCE

- Index case in 5 MS were dead wild boar
- All primary outbreaks in pig holdings or in wild boar found by passive surveillance
- Can be tested if autolytic
- Probability of detecting virus: **55 times higher** in dead animals than in animals shot during hunting

WILD BOAR CARCASS DETECTION

- To assess geographical distribution and spread of ASFV
- Estimated average carcass detection rate: 8.9 %
- Depends on season and habitat type
- Awareness campaigns drastically increase carcass detection rate
- Carcasses difficult to find. Use of trained dogs?

Foto: Marko Saarm / Sakala
CONTACT WITH INFECTIOUS CARCASS: CRITICAL IN TRANSMISSION AMONG WILD BOAR

• More important than direct contact transmission pathway
• Open carcasses = blood (highly infectious)
• Storage of infectious material for weeks
• Carcass removal must happen very quickly!

EPIDEMIOLOGY OF ASF IN EASTERN EUROPE: KEY POINTS

• Outbreaks resolved in pigs
• Continues to spread slowly through wild boar
• Sudden long distance spread: human involvement
• Higher efficacy of passive surveillance
• Introduction in backyard farms: swill, grass, no reported contact with wild boar
• Less than 10 % of wild boar carcasses are found
BORDER CONTROLS, COUNTRIES AT RISK

- Disinfection of vehicles, trucks
- Disinfection footwear
- Confiscation of pork/pork products

Border Belarus-Latvia, photo Food and Vet Services, Latvia
Veterinary workers, Russia. Photo: Xinhua/Reuters

EU ASF STRATEGY: HARMONIZED METHODS IN EASTERN EU

Wild boar

- Baiting allowed only for hunting, max 10kg/km²/month
- Sustained feeding is to be avoided
- Targeted hunting (adult and sub-adult females) encouraged
EU ASF STRATEGY: HARMONIZED METHODS IN EASTERN EU

Wild boar

- Enhanced passive surveillance: all found dead and sick have to be tested using qRT-PCR
- Additional sampling (active surveillance) from hunted animals
- Removal of wild boar carcasses
- Continuous awareness campaigns

Photo: courtesy of Grzegorz Wozniakowski

HIGHLIGHTS, ASF IN EUROPE TODAY

- Subtype Estonia, p72 genotype II, 2 variants are circulating
- Seropositive wild boar are detected: some survive and recover
- Continuing expansion
- New foci, "jumps" to new areas, human-mediated?
- Increased concern from countries not yet affected
CHALLENGES:

Lack of vaccine

Wild boar

ASF VACCINE, PROSPECTS?

- Inactivated ASFV-vaccine: no protection, even with adjuvants
- Subunit vaccines (DNA and peptide-based and viral vectored vaccines): partial protection only
- Live attenuated vaccines (LAV) from virulent or low virulent virus: not safe
- LAV promising in short term, cells to grow them?
- Oral baits: knowledge and experience from CSF vaccination
THE WILD BOAR CHALLENGE

- High reproductive rate
- Wide range climatic conditions
- Wild boar population trend

ASF, PROSPECTS?

Photo courtesy of Denis Kolbasov (kolbasov.denis@gmail.com), Russia
ASF, PROSPECTS?

UNDERSTANDING AND COMBATING AFRICAN SWINE FEVER IN EUROPE (ASF-STOP)

• To join: email to:

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