ASF. THE MAIN THREAT OF THE GLOBAL PIG INDUSTRY

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The Complutense University of Madrid (UCM) is the biggest, oldest (1499) and most complete University in Spain.

- It has 90,000 Students located in two campus.
- With 76 Official Degrees, from four main learning areas: Humanity, Nature and Exact Sciences, Health Sciences and Social Sciences.
- UCM has 20 Faculties, 6 (High Colleges. Universitary Schools) y 184 Departments.
- 9,000 Professionals: 6,000 Teachers and researchers, and 3,000 in services and administration.
- Its library, with more than 2 millions of books and more than 40,000 journals, is the biggest of spanish Universities.
STUDENTS: 1,182
PROFFESOR: 268
78% FEMALE
BSL-3 LABORATORIES
BSL-3 BOXES

MONITORING
- Video
- Environmental conditions
<table>
<thead>
<tr>
<th>Reference Laboratory</th>
<th>Organisation</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>European Union Reference Laboratory for Bovine Tuberculosis</td>
<td>EUROPEAN COMMISSION</td>
<td>July 1st, 2008</td>
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<td></td>
<td>Comission Regulation (EC) No 737/2008</td>
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<td>OIE Reference Laboratory for African Swine Fever</td>
<td>WORLD ORGANISATION FOR ANIMAL HEALTH</td>
<td>January 1st, 2007</td>
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<td>OIE Reference Laboratory for African Horse Sickness</td>
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<td>January 1st, 2007</td>
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ASFV: A old friend 1978–

MAIN CONTRIBUTION:
DEVELOPMENT OF
DIAGNOSIS TEST &
REAGENTS
EPIDEMIOLOGY-CONTROL
and ERADICATION
MODELS
AGENDA:

• Why is ASF different
• ASF Epidemiological evolution and update
• The risk for the pig industry
• Future Challenges and Control Measures
WHY IS ASF DIFFERENT?

THE VIRUS

THE HOST

NO VACCINE

SCENARIOS

WHY IS ASF DIFFERENT?
ASF. The most complex disease of swine

Very complex virus, big size, large genome: 170-190 kb

Very complex molecular structure

Genetic variability

Replication in macrophages

NO production of neutralizing antibodies

200 nm
DNA 170 to 190 Kb
More than 100 structural and infection proteins

22 genotypes (VP72)
ONLY TYPE II&I (OUT AFRICA)

Lack of effective vaccine
Lack of a complete protection
Many trials have been done in the last decades looking for an effective and safe vaccine against ASFV:

1. **INACTIVATED VACCINES** → Ab response NO PROTECTION

2. **ATTENUATED VACCINES** → Ab + cytotoxic specific CD8 → PROTECTION against homologous & heterologous strains BUT → SAFETY PROBLEMS (Virus in tissue), No long term studies

ASF VACCINE: Spain1965
3. **SUBUNIT VACCINES** → very poor, **PARTIAL PROTECTION OF DEAD** but **SAFE ALTERNATIVE**

4. **DNA VACCINES** → **PARTIAL PROTECTION** with some candidates
   - Different expression vectors (plasmids, Bacman…)
   - Enhance CD8 response with no Ab protection

**ANTIBODIES** and **CITOTOXIC CD8 (T cells)** are related with protection

Ab CHRONIC FORMS IN ENDEMIC AREAS

MORE RESEARCH IS NEEDED

*Eradication without vaccine is possible but not easy...*
**DIFFERENT CLINICAL FORMS**

In **Africa** → 22 genotypes / Hyper-acute-acute-sub-acute forms
In **East Europe** → genotype II / only acute isolates are circulating

**SYMPTOMS and LESIONS**
Only Fever and Dead

*Asf infection usually isn’t start as an explosive infection*
Clinical Signs: Easily Confused with:

- Classical Swine Fever
- Erisipelas
- Salmonellosis
- Other Septicaemic conditions
- PDNS

LABORATORY DIAGNOSIS IS NEEDED!!!

NON-IDENTICAL TO EXPERIMENTAL CASES
ASF EPIDEMIOLOGY: historical evolution
ASF EPIDEMIOLOGY: historical evolution

Portugal 1957
ASF EPIDEMIOLOGY: historical evolution

Portugal 1960
ASF EPIDEMIOLOGY: historical evolution

1960s, 1980s
ASF EPIDEMIOLOGY: historical evolution

1990s-2000s African spread
ASF EPIDEMIOLOGY: historical evolution

2007

Georgia
ASF: historical evolution

2015
Outbreaks ASF 2007

Wild boar
Domestic swine
Outbreaks ASF 2010

Wild Boar
Domestic swine

UKRAINE
RUSSIA
GEORGIA
AZERBAIJAN
Outbreaks ASF 2011

- Wild boar
- Domestic swine

Countries mentioned in the image include:
- Belarus
- Lithuania
- Estonia
- Latvia
- Ukraine
- Russia
- Georgia
- Azerbaijan
- Poland

Map indicates the distribution of ASF outbreaks in these regions.
Outbreaks ASF 2013

- Wild boar
- Domestic swine
Figure 9. Distribution of ASF-susceptible populations and location of the most recent virus introduction in Ukraine in 2012.

Left side, top to bottom: density of pigs in the LB sector (2011); density and numbers of wild boar (2007); and density of pigs in the HB sector (2011) by Oblast. Figures are population estimates (thousands). Right side, top to bottom: density of pigs at the resolution of the second administrative division level in eastern Ukraine in the LB sector with 150 km risk zone and in the HB sector with border control posts. The two right side maps include the districts and municipalities of Sumy, Kharkiv, Luhansk, Donetsk, Zaporizhzhya and Crimea Autonomous Republic.

Data: National Authorities, 2010. Note that all classification schemes on the maps are different.
Epidemiology of ASF update: The 3 global scenarios

Currently affected:
ASF in EUROPE
EU PIG DENSITY

Source: Euroestat
WB Distribution and Population Density

Presence of Natural Corridors

Bosch et al., 2012
**ASF MAIN TRANSMISSION ROUTES**

*Transmission*

Direct

Indirect

**Biological Vectors**

Origin of most outbreaks

Only influence in Local SPREAD Outdoor production
Wild boar movements

De la Torre et al, 2013
The occurrence of the first case in Russia (2007) and the last cases in Lithuania, Poland and Latvia (OIE, 2014) proved that they could have an important role in spread.

Also, the presence of infected domestic pigs potentially in contact with wild boar would facilitate the endemicity.
Source of Infection in RF

Iglesias et al., 2014
All the studies performed so far in Europe (Spain and Sardinia) described that the low density wild boar on its own it is not able to maintain the disease without the re-infection from domestic/contaminated products (Laddomada et al., 1994; Manelli et al., 1997, 1998; Mur et al., 2012; Rolesu et al., 2007).

No data are available with high density population of wild boar. Some areas of Europe have High Density of WB.
CSF: Oral Vaccine for WB

DOMESTIC: 0
WB: 3

F. Koenen
Wild boar management

C. Gortázar, 2014
Increase Management Measures are Necessary

- Avoid arable land between suitability areas of WB
- Avoid pig farms in suitability areas of WB

Bosch et al., 2014
MAIN RISKS

Leyenda
- Brotes de PPA

Densidad porcina
(cabezas/km²)
- < 10
- 10 - 50
- 50 - 100
- 100 - 200
- 200 - 500
- 500 - 1000
- 1000 - 2500
- > 2500

0 1,050 2,100 4,200 Km
MAIN RISKS FROM AFRICA

1957
1960
2007
EVALUATING THE RISK OF ASFV ENTRY INTO CHINA

Faostat, 2014

Pig product imports!
(56% global trade)

PIG CENSUS\(\text{(est.)}: 472-476\) millions
PIGS SACRIFICED: 679 millions

Faostat, 2012; OIE, 2012
EVALUATING THE RISK OF ASFV ENTRANCE IN CHINA

Increasing commercial and cooperation relations with African continent

2500km aprox.
840 million of kg of pig offals imported in China in 2012

Specially in Nigeria and South Africa (more than 50,000 residents)

Very strong connections by boat with Africa (new ports under construction)

Mur, et al. 2014
What can we do here?

Do you think California is in Risk?

1. A Good Early detection system

2. A good contingency plan
Feral swine proliferation, 1988-2004

* Includes all counties reporting feral swine in 1988

Source: United States Department of Agriculture
FIELD IS THE FIRST STEP: EARLY DETECTION

COLLABORATION:
ADMINISTRATION– FARMERS – VETS -- HUNTERS

INFORMATION & TRAINING

Good Surveillance
Other ingredients and procedures

- Be aware of ASF
- ASF knowledge
- Risk factors for your country
- Information about farms: census, location and biosecurity level
- Early field detection by active and passive surveillance
- Animal movements and social network analysis
- Diagnosis program (adequate to the risk)
- Communication between laboratories and field
Thank you very much
Muchas gracias
A WORLD FREE of ASF