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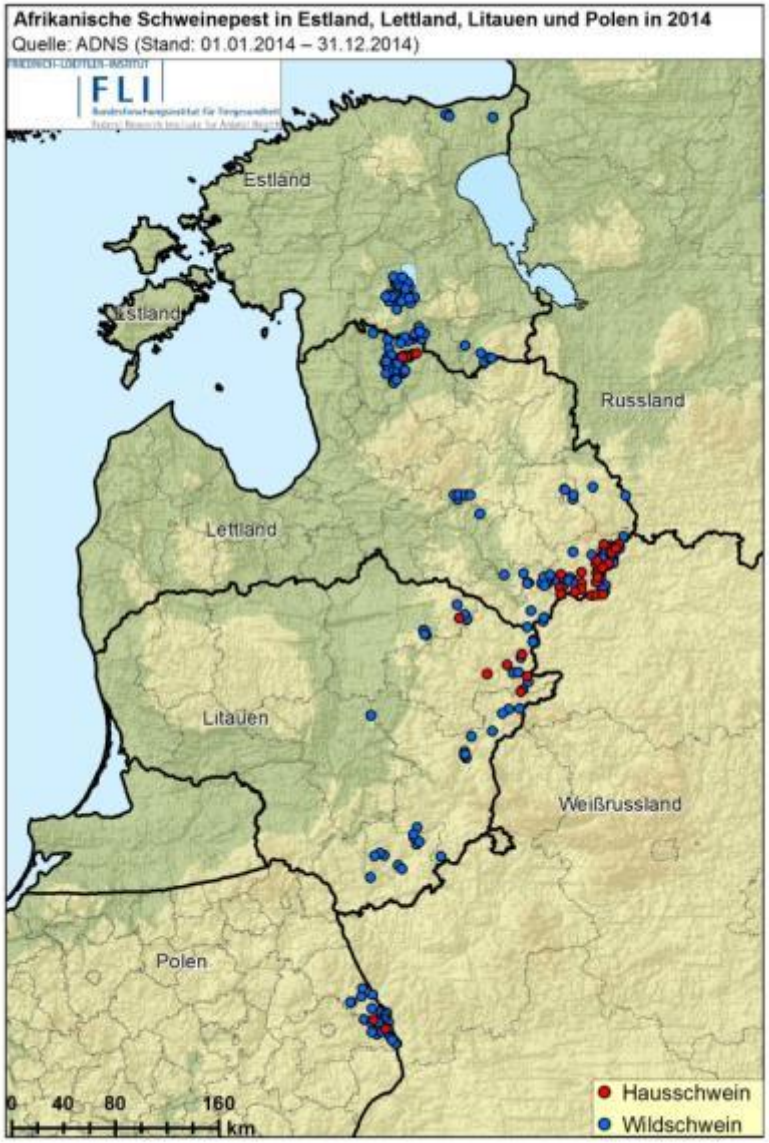
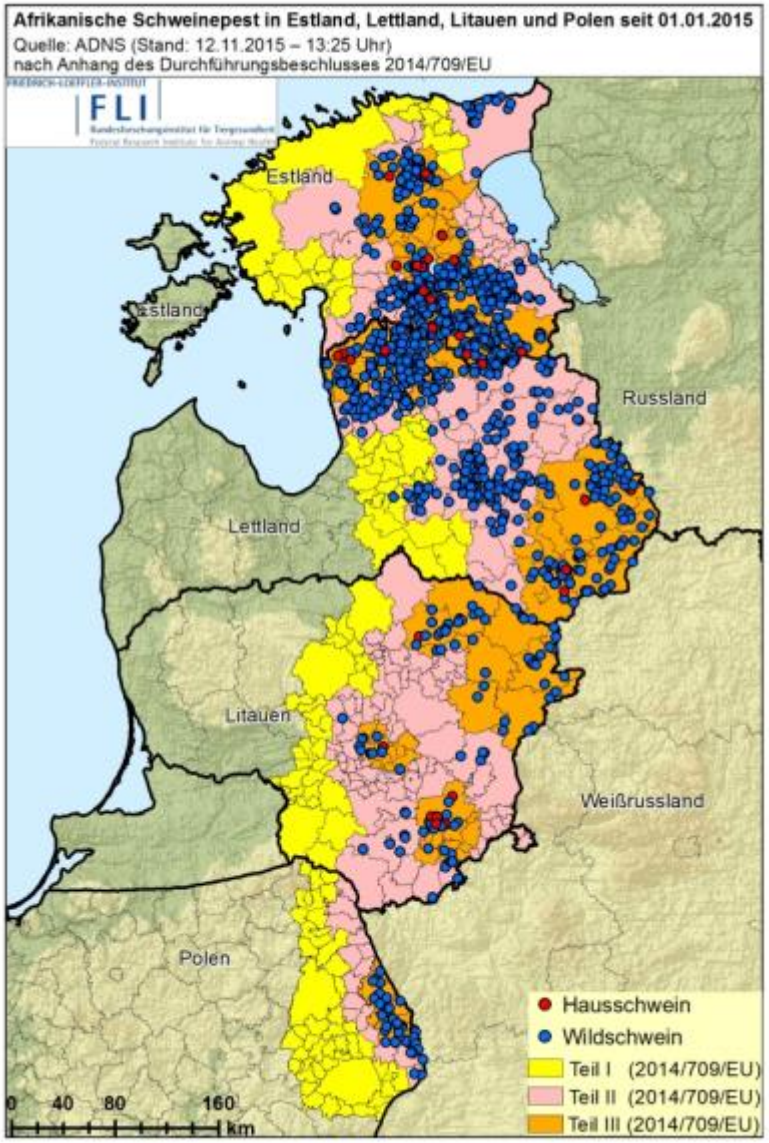
African Swine Fever

experimental transmission studies and and need for additional field data

Sandra Blome, Carola Sauter-Louis, Klaus Depner,
Christoph Staubach, Franz Conraths

… ASF …


Afrikanische Schweinepest in Estland, Lettland, Litauen und Polen in 2014
Quelle: ADNS (Stand: 01.01.2014 – 31.12.2014)
FLI
Estland
Lettland
Russland
Litauen
Weißrussland
Polen
0 40 80 160 km
Hausschwein
Wildschwein


Afrikanische Schweinepest in Estland, Lettland, Litauen und Polen seit 01.01.2015
Quelle: ADNS (Stand: 12.11.2015 – 13:25 Uhr)
nach Anhang des Durchführungsbeschlusses 2014/709/EU
FLI
Estland
Lettland
Russland
Litauen
Weißrussland
Polen
0 40 80 160 km
Hausschwein
Wildschwein
Teil I (2014/709/EU)
Teil II (2014/709/EU)
Teil III (2014/709/EU)

The organism of ASF

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- Big, complex, enveloped DNA-Virus
  Asfivirus of the family *Asfarviridae*
- No vaccine
- Transmission across wide distances with swill feeding (infected pig meat)
- Diagnosis: not clinically
  direct / indirect methods

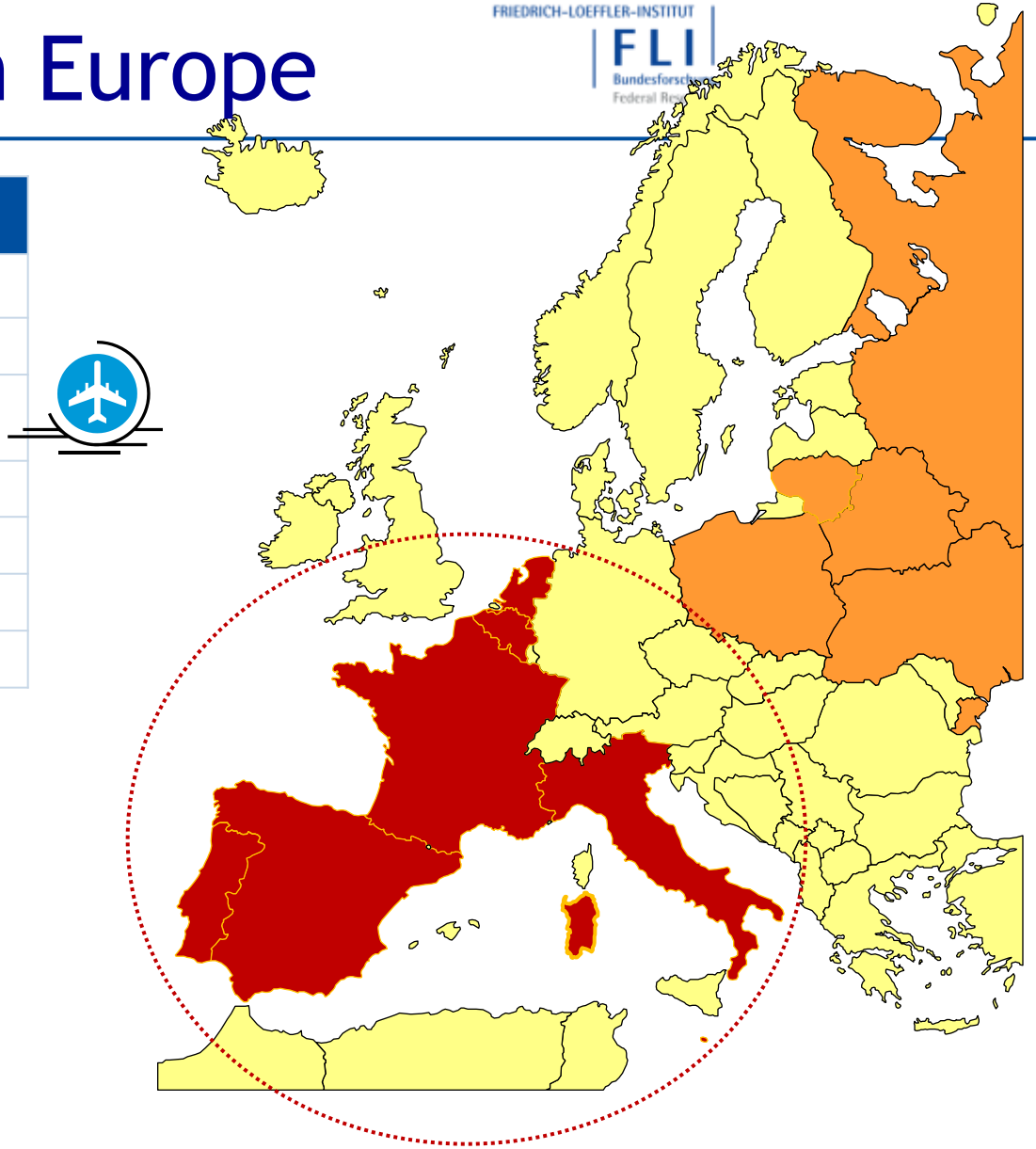
Hosts

- domestic pigs (Europa, Afrika)
- wild boar (Europa, Afrika)
- warthogs
- ticks (Ornithodoros)

ASF ist no zoonosis!

„Historic“ ASF in Europe

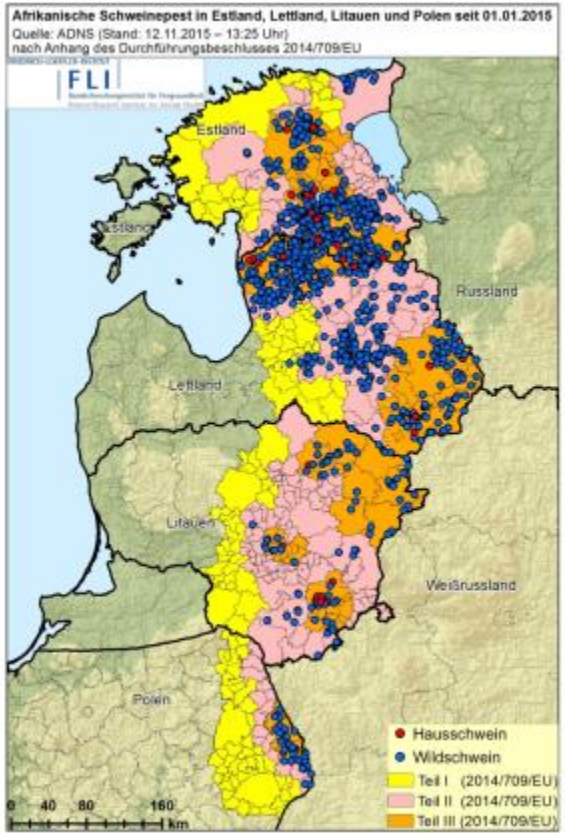
Land	Outbreak
Portugal	1957, 1960-1993; 1999
Spanien	1960-1995
Italien	1967, 1969, 1993 Sardinien: seit 1978
Frankreich	1964, 1967, 1977
Malta	1978
Niederlande	1986
Belgien	1985



ASF in East Europe

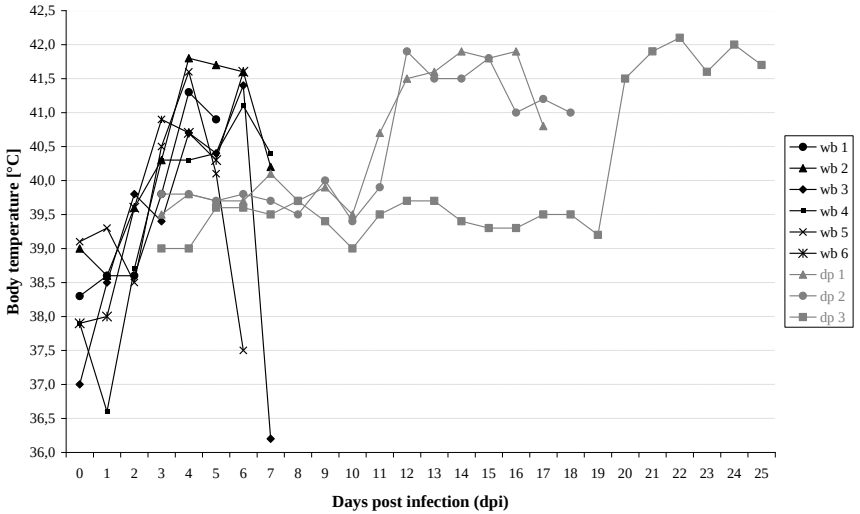
- Since 2007 in the Caucasus and Russia
- Since 2014 also in the EU

- Notifiable animal disease
- Virus differs from the one in Sardinia



What have we learned about the virus and the infection over the last years?

		Days post infection (dpi)										
Animal	**Samples**	**0**	**1**	**2**	**3**	**5**	**6**	**7**	**9**	**13**	**17**	**20**
wb 1	Blood	no ct	nd	no ct	nd	**23**						
	Oropharyngeal swab	no ct	no ct	no ct	**dbt**	no ct	✞					
	Faecal swab	no ct	no ct	no ct	no ct	no ct						
wb 2	Blood	no ct	nd	**dbt**	nd	**22**	**20**	**24**				
	Oropharyngeal swab	no ct	no ct	no ct	no ct	**37**	**37**	**37**	✞			
	Faecal swab	no ct	no ct	no ct	no ct	no ct	**38**	**dbt**				
wb 3	Blood	no ct	nd	no ct	nd	**28**	**22**	**23**				
	Oropharyngeal swab	no ct	no ct	no ct	no ct	no ct	**38**	**34**	✞			
	Faecal swab	no ct	no ct	no ct	no ct	**37**	**34**	**33**				
wb 4	Blood	no ct	nd	no ct	nd	**25**	**26**	**26**				
	Oropharyngeal swab	no ct	no ct	no ct	**37**	no ct	**34**	**37**	✞			
	Faecal swab	no ct	no ct	no ct	no ct	**30**	**29**	**33**				
wb 5	Blood	no ct	nd	**39**	nd	**25**	**23**					
	Oropharyngeal swab	no ct	no ct	no ct	no ct	**39**	**35**	✞				
	Faecal swab	no ct	no ct	no ct	no ct	**dbt**	**29**					
wb 6	Blood	no ct	nd	no ct	nd	**23**	**24**					
	Oropharyngeal swab	no ct	no ct	no ct	**37**	**dbt**	**34**	✞				
	Faecal swab	no ct	no ct	no ct	no ct	**35**	**32**					
dp 1 dp 2 dp 3	blood	no ct	nd	nd	nd	nd	**39**	nd	no ct	**21**	**20**	✞
dp 2	blood	no ct	nd	nd	nd	nd	no ct	nd	no ct	**23**	nd	✞
dp 3	blood	no ct	nd	nd	nd	nd	no ct	nd	**dbt**	no ct	nd	**29***



Course of infection does not differ between domestic and wild pigs

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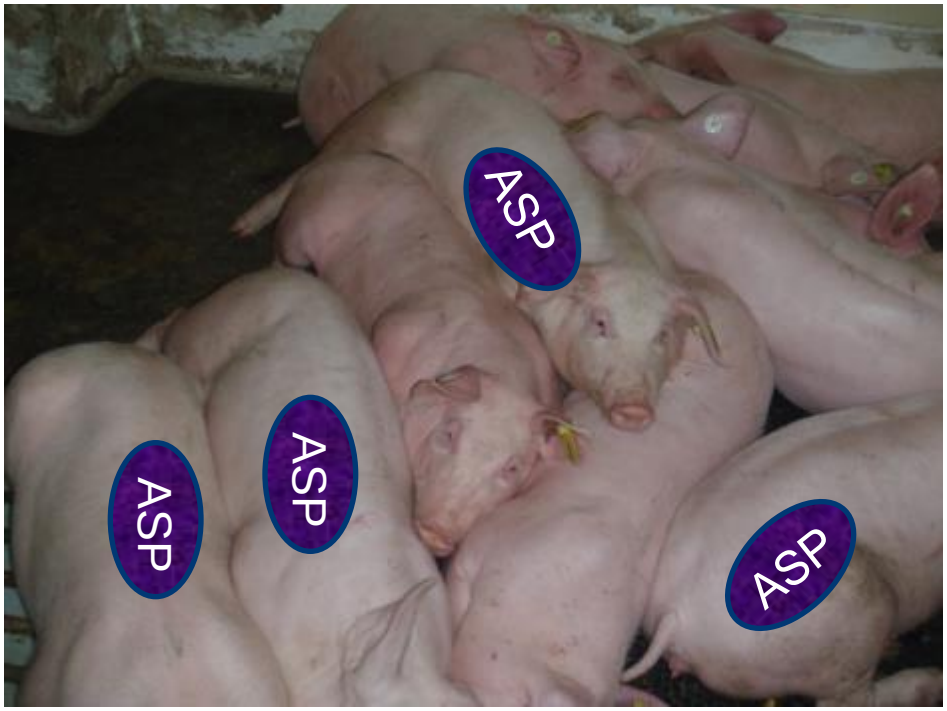
No age dependency!

Nonspecific clinical signs


ASP
ASP
ASP
ASP

???


KSP
KSP
KSP

Low dose of infection and course of infection

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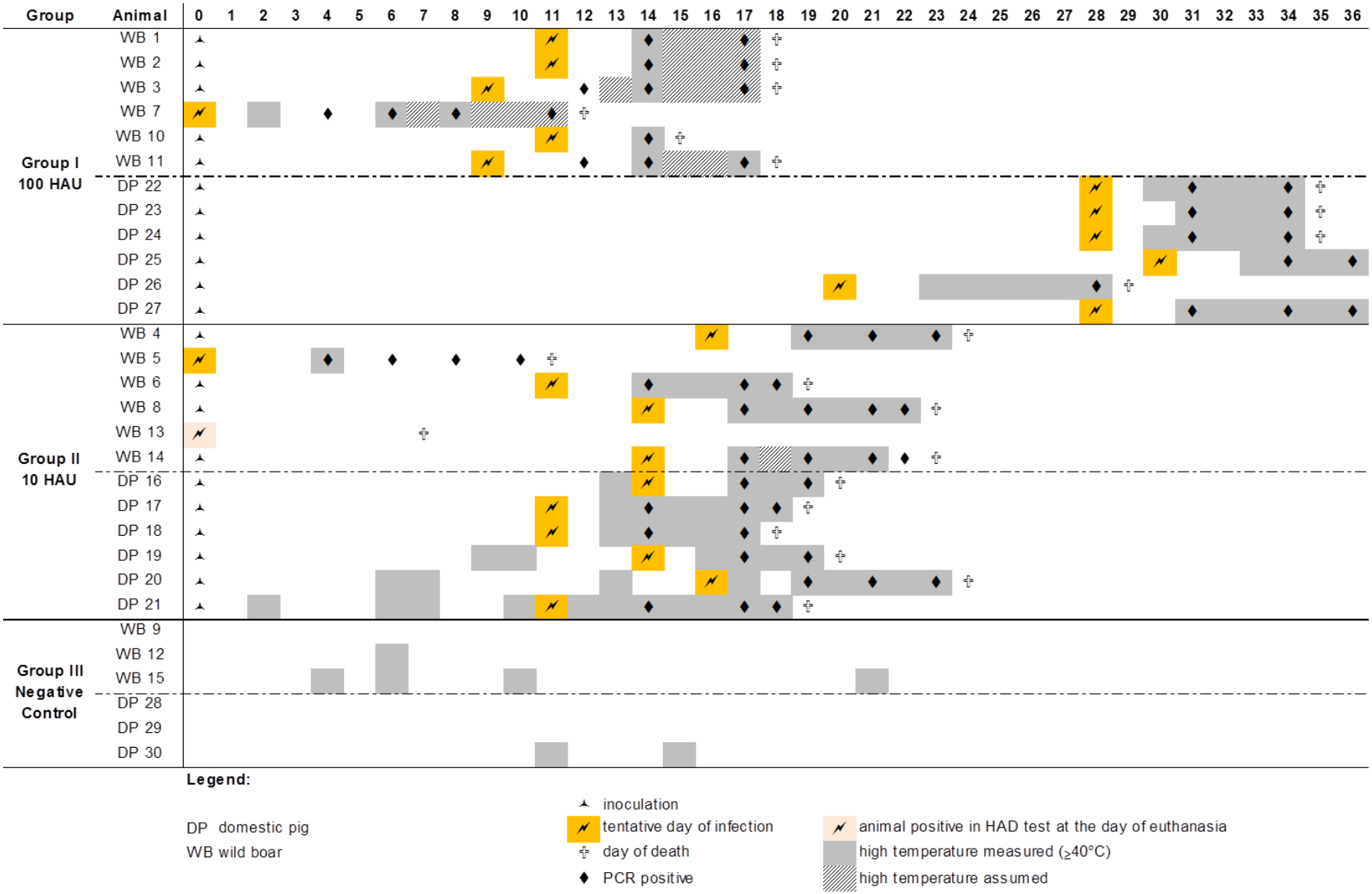


Moderate contagious

Sylvatischer Zyklus in Afrika

Persistierend infizierte, adulte Warzenschweine zeigen keine/ eine niedrige Virämie, können aber infizierte Zecken passiv transportieren

Trans[illegible]und
tran[illegible]Übertragung

Junge Warzenschweine im Bau - Ausgeprägte Virämie, Ansteckungsquelle für die Lederzecken (*Ornithodoros moubata*)

Eintrag in die Hausschweinepopulation

Direkter Kontakt, Verfütterung von Speiseabfällen

Indirekter Kontakt

O. erraticus spielte als Vektor auf der Iberischen Halbinsel eine Rolle

Zyklus in Haus- und Wildschweinen

Schwarzwild ist ebenso empfänglich wie Hausschweine; beteiligt auf Sardinien und im Kaukasus

Quelle der Warzenschweinfotos: Natur-Lexikon.com, Frank Stober und http://www.imagesofafrica.co.za/

Low doses orally applied can be sufficient .... But don‘t have to be...

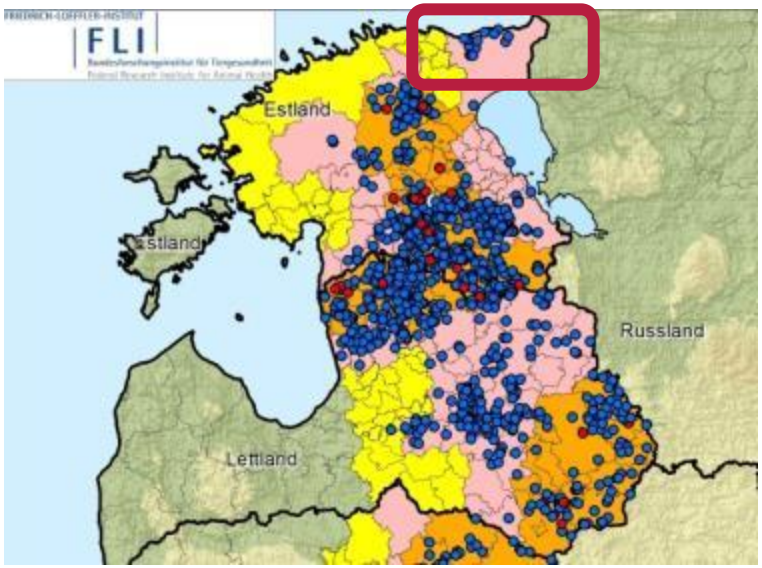
Isolate of Lithuania is comparable to Caucasus … (2014 vs 2008)

Attenuation? … Sardinia08

No!

All pigs dead within 7 days

Pig No. 19 survived…



Attenuated virus

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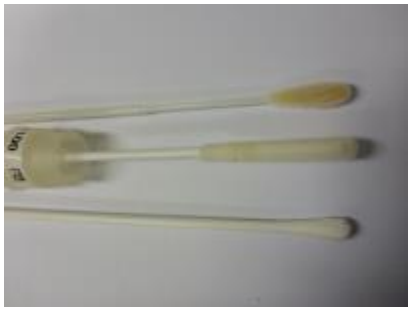
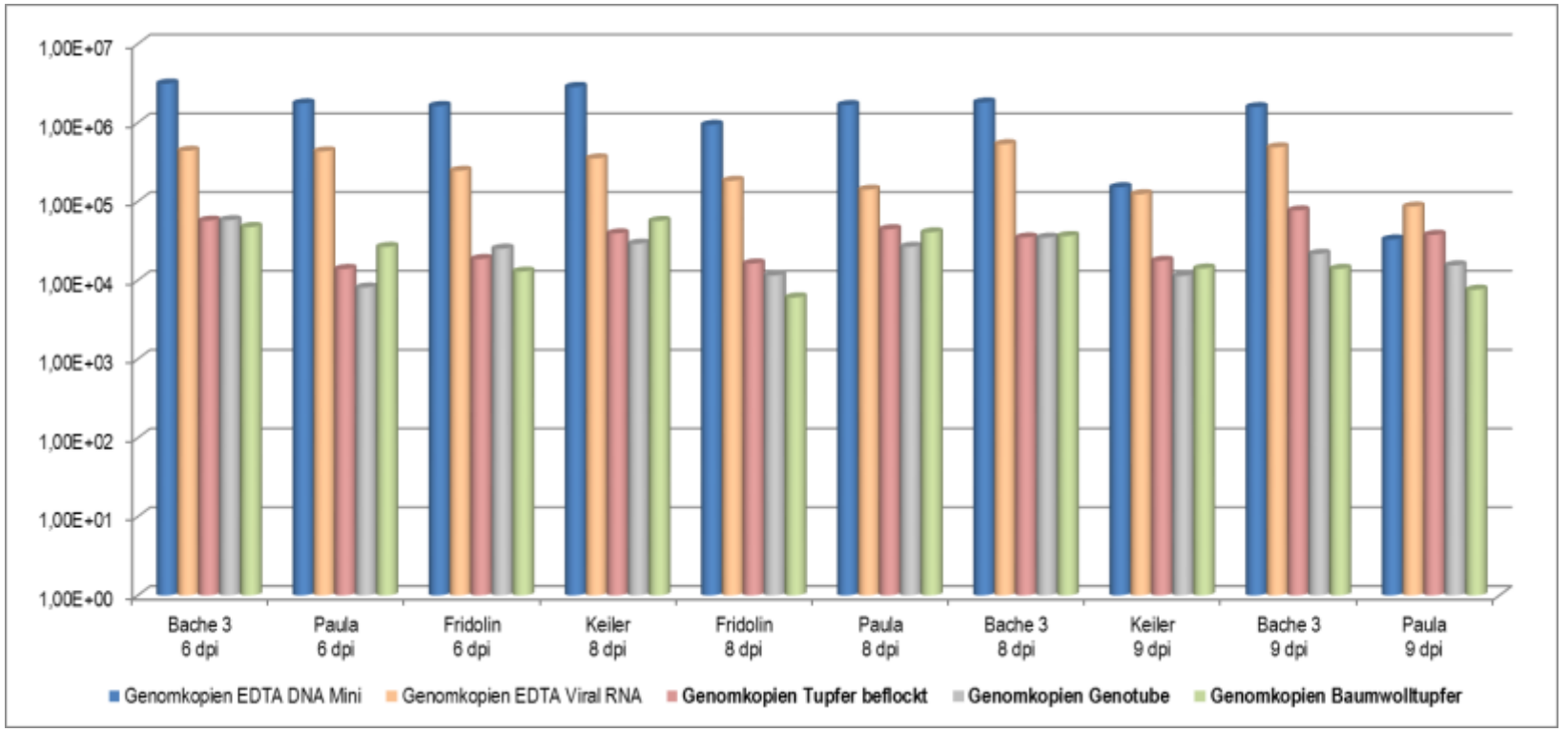
- **ASFV NL 1986**
- 20 of 30 infected fattening pigs survived
- Possibly age dependency?
- 8 were still ASFV-genome positive in blood at day 91
- No ASFV found in organs of a recovered animal
- Sentinels added day 90
- Carrier?

Dead wild boar…

Foto: K. Depner

Swabs




1,00E+07
1,00E+06
1,00E+05
1,00E+04
1,00E+03
1,00E+02
1,00E+01
1,00E+00
Bache 3 6 dpi
Paula 6 dpi
Fridolin 6 dpi
Keiler 8 dpi
Fridolin 8 dpi
Paula 8 dpi
Bache 3 8 dpi
Keiler 9 dpi
Bache 3 9 dpi
Paula 9 dpi
Genomkopien EDTA DNA Mini
Genomkopien EDTA Viral RNA
Genomkopien Tupfer beflockt
Genomkopien Genotube
Genomkopien Baumwolltupfer

Quality of samples and storage…

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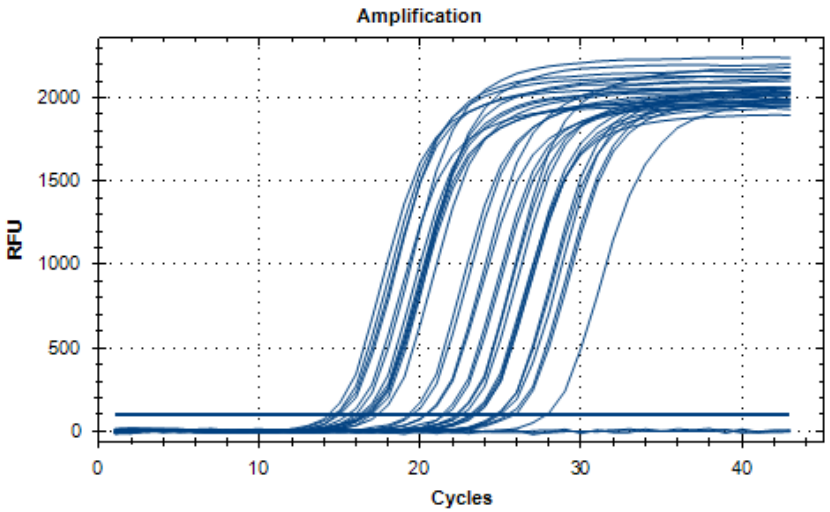
		0-Wert	1 Monat			2 Monate			3 Monate		
			4°C	20°C	37°C	4°C	20°C	37°C	4°C	20°C	37°C
		cq	cq	cq	cq	cq	cq	cq	cq	cq	cq
Bache 3	Blut	24,78	23,57	26,15	20,94	28,51	25,41	20,58	27,74	25,49	19,97
	Milz	20,09	18,33	30,77	23,43	23,71	25,17	21	20,67	28,12	27,6
	Muskel	25,55	25,94	27,02	25,78	27,53	27,4	29,76	29,26	41,41	27,3
	Kot	34,4	32,95	33,54	34,27	29,26	28,86	31,3	33,62	33,9	33,57
Paula	Blut	27,5	27,8	29,65	26,47	27,66	32,69	29,37	31,07	31,54	27,68
	Milz	21,75	20,41	24,18	27,02	26,17	31,81	28,14	25,27	26,94	27,28
	Muskel	27,39	26,29	28,25	25,88	28,44	32,59	30,11	27,15	32,75	28,41
	Kot	40,32	35,55	42,48	35,46	30,86	31,87	no cq	40,7	37,81	no cq
Hannibal	Blut	22,55	24,09	21,16	18	28,06	26,33	20,72	27,75	24,27	18,66
	Milz	18,85	18,62	18,93	27,52	28,45	29,31	20,46	19,85	19,78	24,28
	Muskel	26,05	25,65	27,63	22,94	26,9	26,05	27,47	28,6	24,45	25,19
	Kot	40,44	36,38	no ct	30,9	32,19	30,33	31,45	42,24	38,8	41,74

Does not make much difference …



Detection of antibodies

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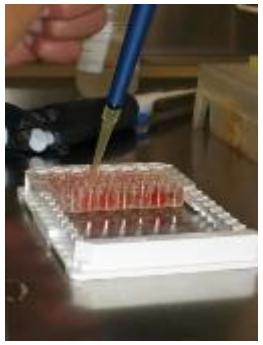
- Experiment in wild pigs (course of disease): NONE
- Experiment on age dependency: NONE
- Experiment with low dose of infection: 3 questionable reactions in the ELISA without confirmation in other tests
- Experiment with ASFV Lithuania2014: NONE
- Experiment with Sardinia08: NONE
- OURT88/3: high titres and positive reactions in ELISA …

Not the choice of diagosis
in areas free of the disease ...



Field data needed

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- Mortality
  - In experimental studies: nearly always 100%
  - In the field:
    - Disease is persistent in some areas
    - Not in others

Field data needed

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- Contagiosity
  - „highly contagious“
  - ????
- Serology
  - Negatives and positives
  - Age-dependency
  - Duration of sero-conversion
  - Presence of PCR-positive and serology

Field data needed

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- Survival
  - Comparable samples
  - Virological and serological samples
  - => determine importance of survival
  - => determine importance of carriers?
  - Determine factors for survival
    - Season?
    - Area?
    - Pressure of infection?

Field data needed

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- Wild boar
  - Population structure
  - Over time
  - Regional

Field data needed

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- Domestic pigs
  - Summer
  - Population structure
  - Information on negative farms

Summary

- Current ASF-virus is highly virulent to domestic and wild pigs
- Infection nearly always letal
- Very unspecific clinical signs
- No age dependency with high-virulent strains
- No dependency on dose of infection
- Very low dose of infection can be sufficient → „Sandwich-Theory“
- Moderate contagious
- Virus can be detected in PCR in many matrices
- Detection of antibodies less important

Thank you very much!