6th European Symposium of
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ESPHM 2014

ANTIBIOTIC USE IN PIG PRODUCTION - WHERE ARE WE GOING?

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Suggestions from Joint Programming Initiative on Antimicrobial resistance (JPIAR)

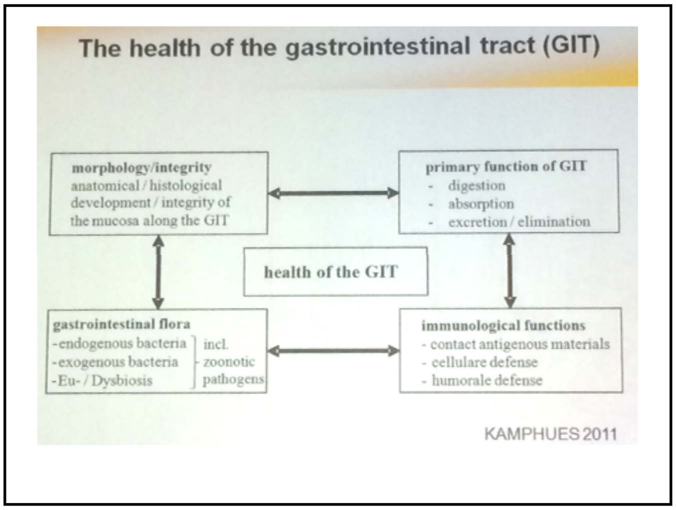
1. New/better treatments
2. Better diagnostics
3. Better surveillance
4. Understanding transmission
5. Understanding the role of the environment
6. Demonstration projects

New/better treatments

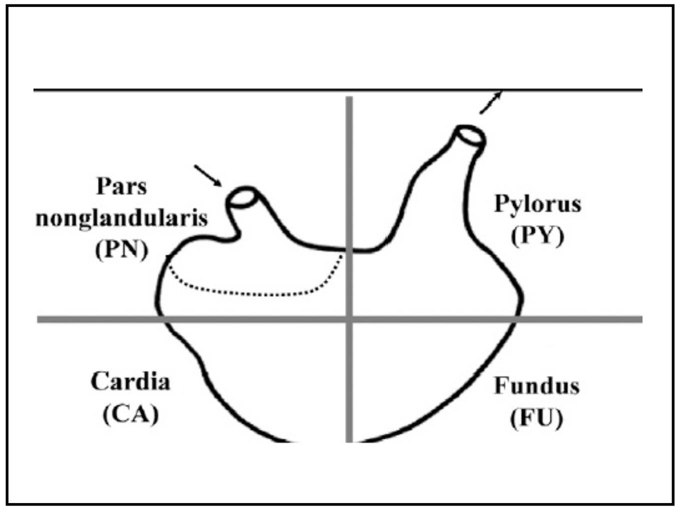
1. New targets new antibiotics
2. Alternatives to antibiotics
   1. Flora stabilization
   2. Immune therapy/stimulation
   3. New principles
      - Anti-virulence therapy
      - Anti-colonization therapy
      - Anti-resistance therapy
3. Re-use of old forgotten antibiotics
4. Better use of existing antibiotics

THE PHYSICAL FORM OF DIETS - IMPACTS ON PIGS' HEALTH, PERFORMANCE AND WELLBEING

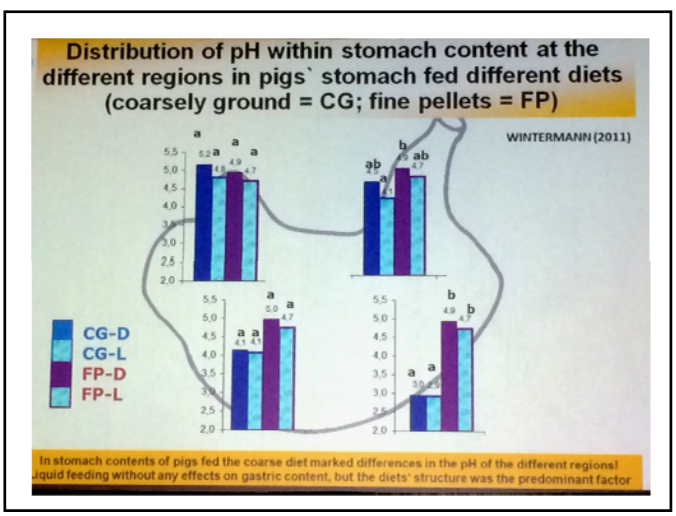
Kamphues Joseph
Institute of Animal Nutrition University of Veterinary Medicine Hannover, Foundation, Germany



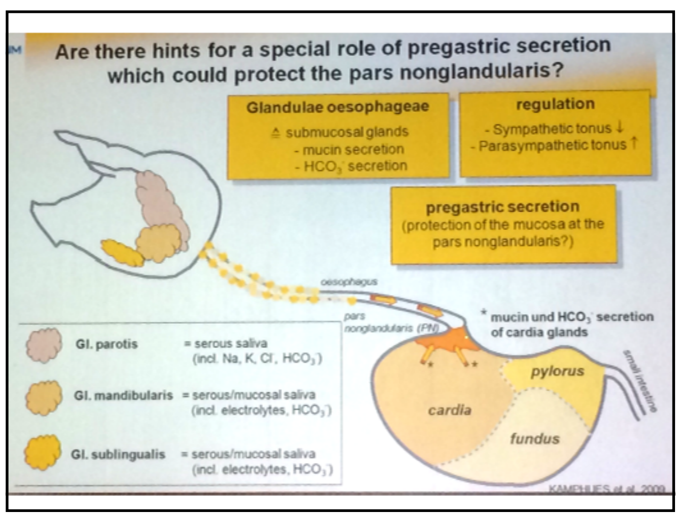
The health of the gastrointestinal tract (GIT)
morphology/integrity
anatomical / histological development / integrity of the mucosa along the GIT
primary function of GIT
- digestion
- absorption
- excretion / elimination
health of the GIT
gastrointestinal flora
-endogenous bacteria
-exogenous bacteria
-Eu- / Dysbiosis
incl. zoonotic pathogens
immunological functions
- contact antigenous materials
- cellulare defense
- humorale defense
KAMPHUES 2011



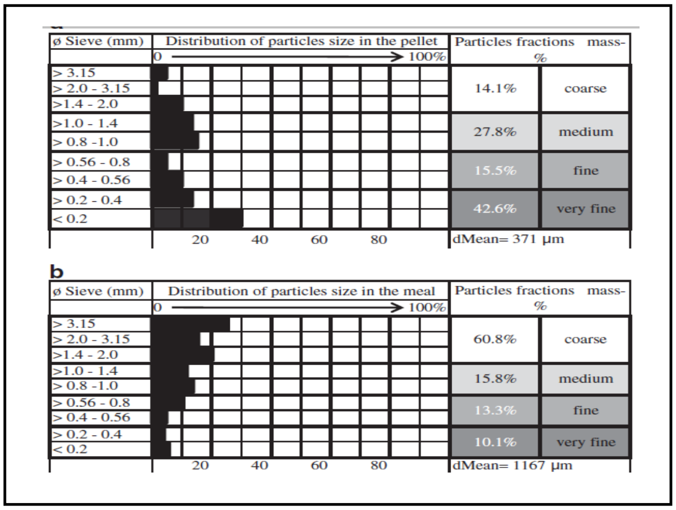
Pars nonglandularis (PN)
Pylorus (PY)
Cardia (CA)
Fundus (FU)



Distribution of pH within stomach content at the different regions in pigs` stomach fed different diets (coarsely ground = CG; fine pellets = FP)
WINTERMANN (2011)
CG-D
CG-L
FP-D
FP-L
In stomach contents of pigs fed the coarse diet marked differences in the pH of the different regions!
Liquid feeding without any effects on gastric content, but the diets' structure was the predominant factor



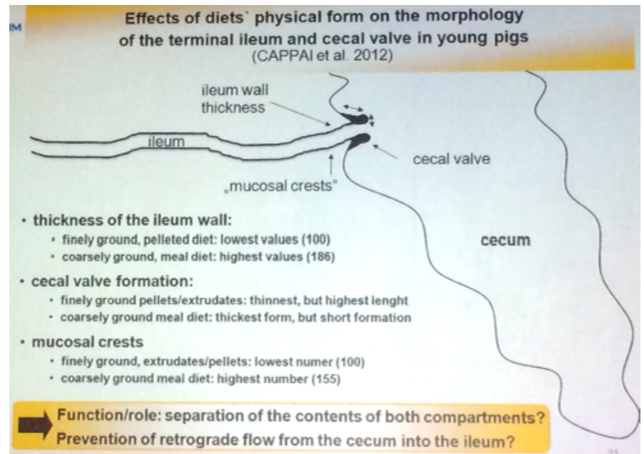
Are there hints for a special role of pregastric secretion which could protect the pars nonglandularis?
Glandulae oesophageae
≙ submucosal glands
- mucin secretion
- HCO3- secretion
regulation
- Sympathetic tonus ↓
- Parasympathetic tonus ↑
pregastric secretion
(protection of the mucosa at the pars nonglandularis?)
oesophagus
pars nonglandularis (PN)
* mucin und HCO3- secretion of cardia glands
Gl. parotis = serous saliva (incl. Na, K, Cl-, HCO3-)
Gl. mandibularis = serous/mucosal saliva (incl. electrolytes, HCO3-)
Gl. sublingualis = serous/mucosal saliva (incl. electrolytes, HCO3-)
pylorus
cardia
fundus
small intestine

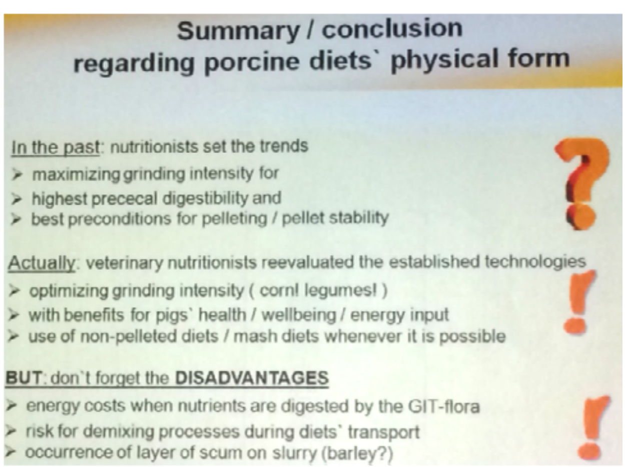


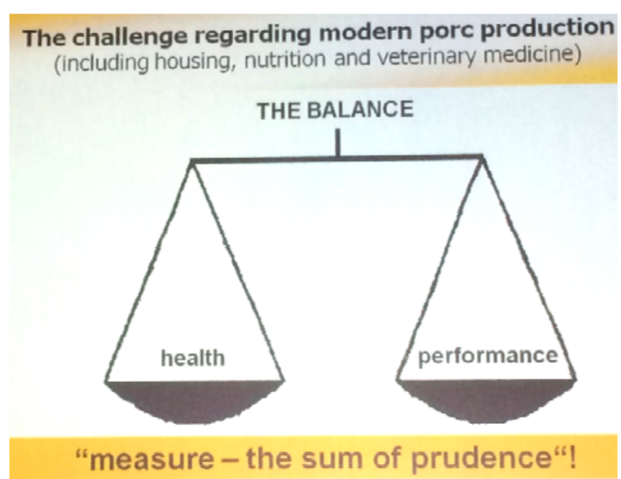
ø Sieve (mm)	Distribution of particles size in the pellet (0 → 100%)	Particles fractions mass-%	
> 3.15		14.1%	coarse
> 2.0 - 3.15			
>1.4 - 2.0			
>1.0 - 1.4		27.8%	medium
> 0.8 -1.0			
> 0.56 - 0.8		15.5%	fine
> 0.4 - 0.56			
> 0.2 - 0.4		42.6%	very fine
< 0.2			
	20 40 60 80	dMean= 371 µm	

b

ø Sieve (mm)	Distribution of particles size in the meal (0 → 100%)	Particles fractions mass-%	
> 3.15		60.8%	coarse
> 2.0 - 3.15			
>1.4 - 2.0			
>1.0 - 1.4		15.8%	medium
> 0.8 -1.0			
> 0.56 - 0.8		13.3%	fine
> 0.4 - 0.56			
> 0.2 - 0.4		10.1%	very fine
< 0.2			
	20 40 60 80	dMean= 1167 µm	







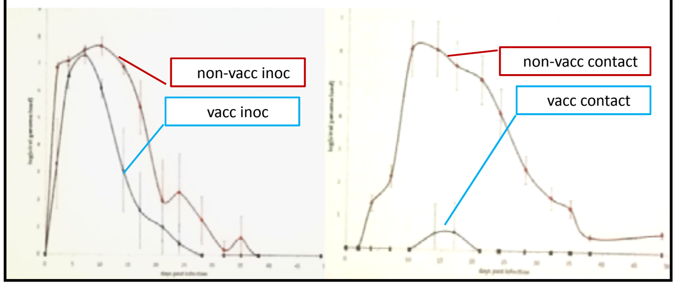
REDUCTION OF PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV) TRANSMISSION IN VACCINATED PIGS

Rose N.[1], Renson P.[1], Andraud M.[1], Paboeuf F.[1], Le Potier M.[1], Bourry O.[1]
[1]Anses ~ Ploufragan ~ France

Protocol

- **56 SPF piglets**, 3 weeks-old
  - + 8 control piglets
  - + Vaccination Porcilis PRRS® (ID) 3 WO
  - **+ Challenge D31 PV**
    (PRRS/FR/29/24/1/2005 [EU genotype, subtype 1], Intra-nasal route, 5 10^5 DCP_{50}/pig)
  - + 12 contact pigs (direct contact 24h PI)
- Follow-up during 49 dpi, blood samples every 3 days
- **qRT-PCR** for viremia **specific** to the challenge strain PRRS/FR/29/24/1/2005 (differential PCR from the vaccine strain)

- q-RT-PCR in pigs
  - vaccinated VS. non-vaccinated
  - inoculated VS. contacted



Conclusion and perspectives

- High efficacy of vaccination on reduction of PRRS transmission in SPF pigs and in experimental conditions
  ➪ consistent with clinical and biological data (Martelli et al., 2007; 2009)
- According to R estimate in vaccinated pigs ➪ high efficacy in *eradicating PRRSv in pig farms should be expected*
- Further parameters have to be investigated to assess the expected outcome in field conditions
  ➪ interference with maternal antibodies?
  ➪ time elapsed between vaccination/infection
  ➪ interaction with husbandry / biosecurity practices

PRRS CONTROL AND ERADICATION OPTIONS FOR BREED TO WEAN FARMS

Johnson C.[1]
[1]The Maschhoffs, LLC ~ Carlyle ~ United States

- http://www.ncbi.nlm.nih.gov/pubmed/24931129
- http://conservancy.umn.edu/bitstream/147026/1/Linhares_umn_0130E_13487.pdf

- Better Evidence!
  - Time to Negative Pig Study Update
    - Exposure Method
    - Prior Immunity Value
    - Time to Baseline Production (TTBP)
    - Time to PRRSV Stability (TTS)

meaning

- Herds were assumed to achieve “TTS status” when there was a failure to detect PRRSv RNA in serum of pre-weaning pigs by RT-PCR over a 90-day period
- Time to baseline production (TTBP) was defined as time, in weeks, it took to recover the levels of ‘weaned pigs per week’ that the herd had prior to PRRSv-detection (i.e. time to “in control” levels of productivity).

- TTBP was significantly shorter and productivity was less affected in farms with prior PRRSv infection and herds assisted by a specific veterinary clinic.

Table 3 – Comparison of PRRSv severity (Δ pigs A), total loss (Δ pigs B) and time to baseline production (TTBP) between groups (univariate analysis).

	LVI	MLV	p-value*
Δ pigs A (mean ± std. error)	678.4 ± 106.0	335.3 ± 141.4	0.0681
Δ pigs B (mean ± std. error)	2665.0 ± 313.0	1222.2 ± 395.3	0.0095
TTBP (median and 25th to 75th percentile)	21 (13, 24)	10 (0, 15)	<0.0001

* Between group comparisons for Δ pigs A and Δ pigs B were done using t-test and for TTBP using Log-rank test.

– TTS
- Significant variability exists
- Regardless of this variability, two significant associations:

BTW herds exposed via LVI achieved TTS significantly faster than comparable herds achieving stabilization through MLV

TTS poorly correlated with TTBP

TTBP highly correlated with total pre-weaning losses

Prior herd immunity correlated with earlier TTBP, with a drastic increase i total weaned piglet production relative to PRRSV naïve herds

BTW herds using MLV reached TTBP significantly faster than herds using L

why LVI herds achieved TTS faster than MLV herds.

- First, immune response to virulent PRRSv is faster and stronger than that to attenuated virus, as measured by duration and magnitude of viremia and antibody titers.
- Secondly, exposing to resident virus likely induces quicker protective immune response than a non-related virus, MLV vaccine

- Two Significant Shifts in PRRS Management
  - Exposure Method = MLV
    - Value of rapid TTS < Value of rapid TTBP
  - PRRSV Control vs. PRRSV Eradication
    - Outbreak Frequency is key assumption
    - Outbreak Frequency assumption should be regularly challenged as key variables for the BTW herd change

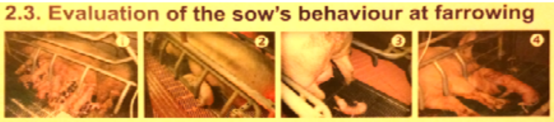
Conclusions

- Prior immunity to PRRSv was assumed to reduce total weaned pig losses during an outbreak by almost 82% due to the shorter TTBP

SOW BEHAVIOUR EVALUATION AT FARROWING AND FIRST CONCLUSIONS

Yannig LE TREUT, Audrey SACY, Eric CHEVAUX, Guy-Pierre MARTINEAU

2.3. Evaluation of the sow's behaviour at farrowing



Score	Observations
1	The sow is calm, lies on her side and lets piglets suckle during farrowing. She does not react to human activity. The sow pursue the farrowing effort without consideration for her piglets.
2	The sow lies on her belly, disturbing piglets feeding. She remains alerted by human activity without standing up. The sow can grunt. She is showing signs of nervosity and stereotypic behaviour: playing with her drinking trough, biting the crate structures....
3	The sow is nervous. She keeps standing up and lying down again, either triggered by human activity or at piglet expulsion.The sow grunts systematically at human approach, but does not try to bite. Piglets crushing is frequently observed.
4	The sow is very nervous and very agitated. She seems to be annoyed by the piglets and can bite them. She keeps standing up frequently and does not let her piglets suckle. When lying on her side, the sow stands up during piglet expulsion or when a piglet tries to suckle. Shows aggressiveness against human.

1. Litters characteristics according to sow behaviour

✓ A majority of easy farrowing observed for the calmer sows (score 1) (Table 3

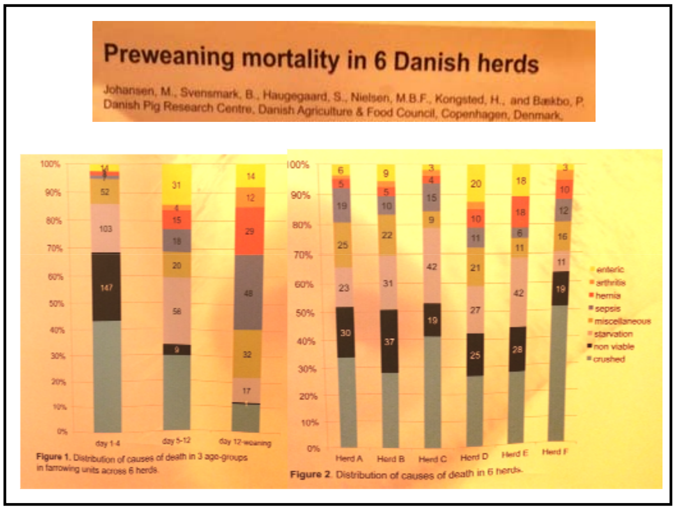
Farrowing	Behav. score 1	Behav. score 2	Behav. score 3	Behav. score 4	Live born/ total born	Manual exploration	Duration
Easy	24 (69%)	8 (23%)	3 (9%)	0 (0%)	12.94/14.14	0%	1H27
Medium	11 (38%)	10 (34%)	7 (24%)	1 (3%)	11.11/13.64	66%	2H17
Difficult	1 (25%)	1 (25%)	1 (25%)	1 (25%)	11.0/11.75	25%	2H48

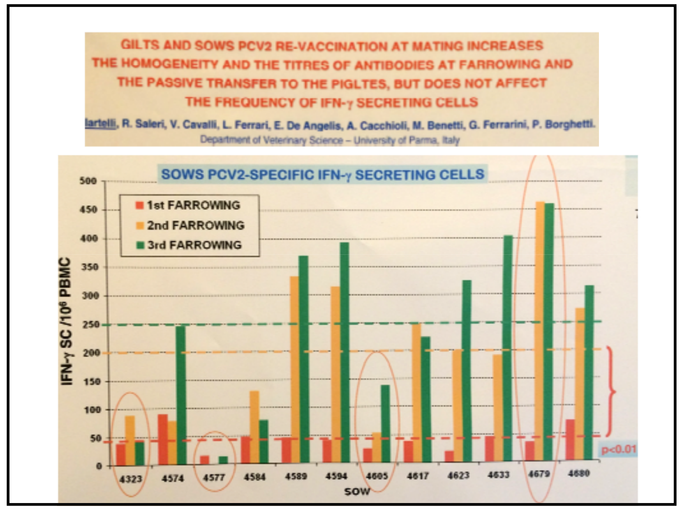
Table 3 : Sows' behaviour and farrowing characteristics according to the difficulty of the process.

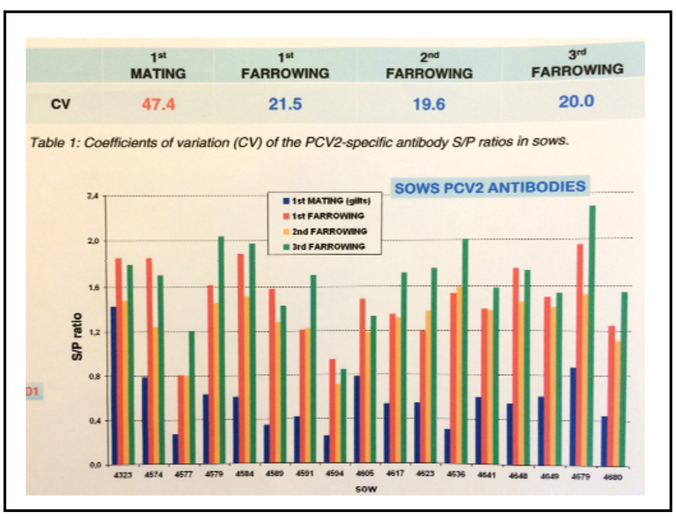
✓ Only 36/67 sows showed a behaviour in favour of the piglets, allowing a quick and effective intake of colostrum.
✓ 2/3 of the «medium» farrowing required manual exploration ($P<0.001$).
✓ The more difficult, the longer the farrowing process.
✓ «Easy» farrowing leads to fewer losses at birth: 9.0% (Easy), 13.5% (Medium and 29.3% (Difficult).
✓ More frequent interventions for the nervous & agitated sows ($P<0.1$) (Table 4).

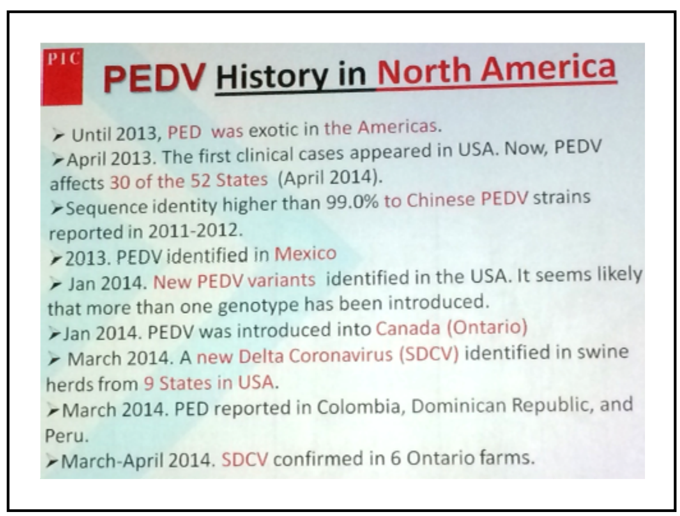
Sow behaviour score	Litter size (n)	Total litter weight (kg)	Farrowing duration (H)	Piglet vitality score	Exploration (%)	Stillborn/ total born / (%)
1	15.0	20.17	1H45	1.51^a	19	6
2	14.5	19.41	1H48	1.36^a	33	14
3	15.4	20.24	1H42	1.27^b	55	12
4	15.6	19.44	4H50	1.87^a	50	6

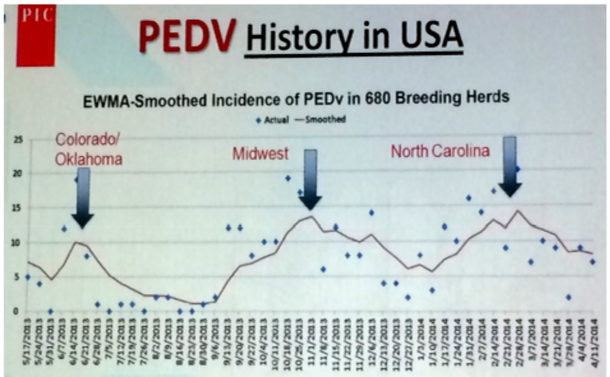
Table 4 : Farrowing and litter parameters according to the maternal behaviour score (a,b: $P<0.05$).

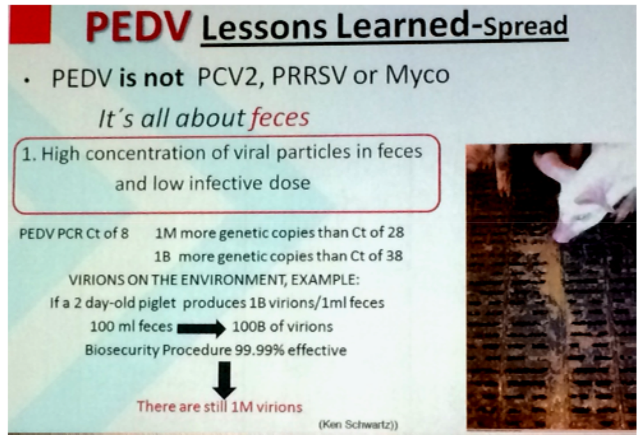

Preweaning mortality in 6 Danish herds
Johansen, M., Svensmark, B., Haugegaard, S., Nielsen, M.B.F., Kongsted, H., and Bækbo, P.
Danish Pig Research Centre, Danish Agriculture & Food Council, Copenhagen, Denmark,
enteric
arthritis
hernia
sepsis
miscellaneous
starvation
non viable
crushed
Herd A
Herd B
Herd C
Herd D
Herd E
Herd F
Figure 1. Distribution of causes of death in 3 age-groups in farrowing units across 6 herds.
Figure 2. Distribution of causes of death in 6 herds.


GILTS AND SOWS PCV2 RE-VACCINATION AT MATING INCREASES THE HOMOGENEITY AND THE TITRES OF ANTIBODIES AT FARROWING AND THE PASSIVE TRANSFER TO THE PIGLTES, BUT DOES NOT AFFECT THE FREQUENCY OF IFN-γ SECRETING CELLS
lartelli, R. Saleri, V. Cavalli, L. Ferrari, E. De Angelis, A. Cacchioli, M. Benetti, G. Ferrarini, P. Borghetti.
Department of Veterinary Science – University of Parma, Italy
SOWS PCV2-SPECIFIC IFN-γ SECRETING CELLS
1st FARROWING
2nd FARROWING
3rd FARROWING
IFN-γ SC /10^6 PBMC
SOW
p<0.01


	1st MATING	1st FARROWING	2nd FARROWING	3rd FARROWING
CV	47.4	21.5	19.6	20.0
Table 1: Coefficients of variation (CV) of the PCV2-specific antibody S/P ratios in sows.
SOWS PCV2 ANTIBODIES
1st MATING (gilts)
1st FARROWING
2nd FARROWING
3rd FARROWING
S/P ratio
SOW


PIC
PEDV History in North America
➢ Until 2013, PED was exotic in the Americas.
➢April 2013. The first clinical cases appeared in USA. Now, PEDV affects 30 of the 52 States (April 2014).
➢Sequence identity higher than 99.0% to Chinese PEDV strains reported in 2011-2012.
➢2013. PEDV identified in Mexico
➢ Jan 2014. New PEDV variants identified in the USA. It seems likely that more than one genotype has been introduced.
➢Jan 2014. PEDV was introduced into Canada (Ontario)
➢ March 2014. A new Delta Coronavirus (SDCV) identified in swine herds from 9 States in USA.
➢March 2014. PED reported in Colombia, Dominican Republic, and Peru.
➢March-April 2014. SDCV confirmed in 6 Ontario farms.



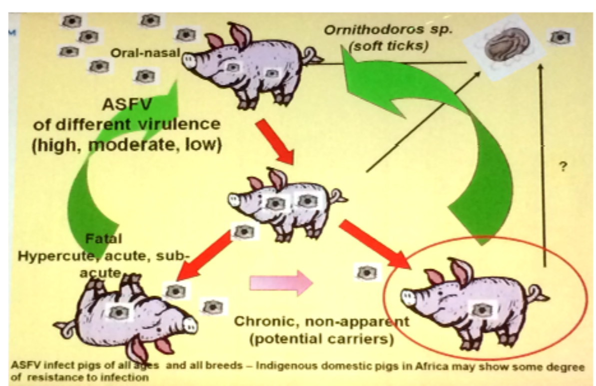


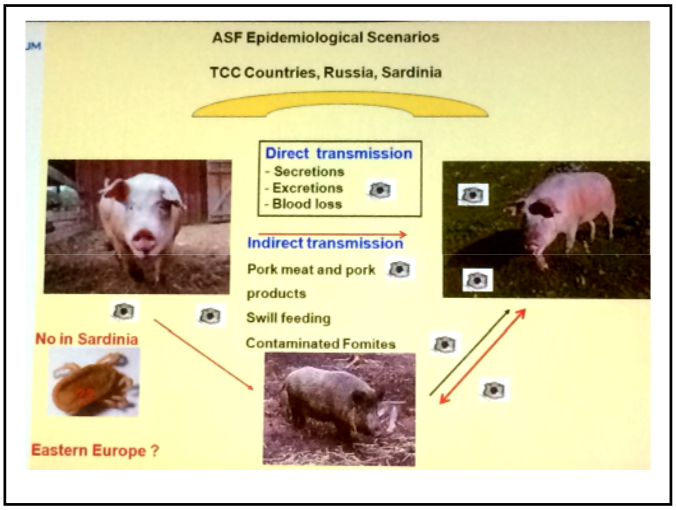
- 17.3% of the trailers were contaminated with PEDv before unloading the pigs (from 2 to 69%)
- 11.4% of the trailers that were not contaminated with PEDv on arrival, were subsequently contaminated during unloading

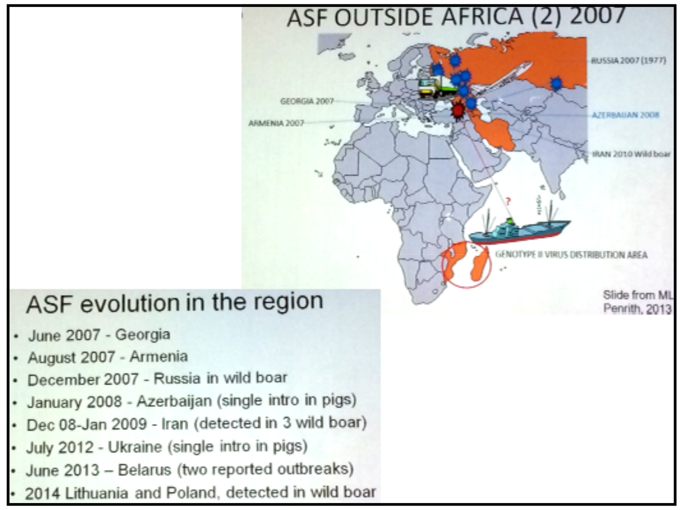
- Farms within 1 mile of a PED positive farm had an 8.4 times higher risk of infection
- Farms within 2 miles of a PED positive farm had a 6.3 times higher risk of infection
- Greater than 3 miles from a positive farm had no increased risk of infection
- Air?

African swine fever

http://asforce.org/course




ASF Epidemiological Scenarios
TCC Countries, Russia, Sardinia
Direct transmission
- Secretions
- Excretions
- Blood loss
Indirect transmission
Pork meat and pork products
Swill feeding
Contaminated Fomites
No in Sardinia
Eastern Europe ?


ASF OUTSIDE AFRICA (2) 2007
RUSSIA 2007 (1977)
GEORGIA 2007
ARMENIA 2007
AZERBAIJAN 2008
IRAN 2010 Wild boar
GENOTYPE II VIRUS DISTRIBUTION AREA
Slide from ML Penrith, 2013
ASF evolution in the region
• June 2007 - Georgia
• August 2007 - Armenia
• December 2007 - Russia in wild boar
• January 2008 - Azerbaijan (single intro in pigs)
• Dec 08-Jan 2009 - Iran (detected in 3 wild boar)
• July 2012 - Ukraine (single intro in pigs)
• June 2013 – Belarus (two reported outbreaks)
• 2014 Lithuania and Poland, detected in wild boar


zoetis