



Diagnosis of porcine circovirus diseases and PCV2 vaccination strategy

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Porcine circovirus diseases (PCVDs) – the classics

- Postweaning multisystemic wasting syndrome (PMWS) ✓
- Reproductive failure ✓
- Porcine dermatitis and nephropathy syndrome (PDNS) ?
- Porcine respiratory disease complex (PRDC) ?
- Proliferative and necrotising pneumonia ✓?
- Congenital tremors type All No

How many of them are real PCVDs?

Porcine circovirus diseases (PCVDs) – new?

- PCV2-associated enteric disease:
 - Diarrhoea as predominant clinical sign
 - Granulomatous enteritis associated with PCV2 to high amounts
- PCV2-associated respiratory disease:
 - Respiratory distress as predominant clinical sign
 - Lymphohistiocytic pneumonia associated with PCV2 to high amounts

Such lesions can be observed as part of PMWS... DO WE SEE THEM IN ABSENCE OF PMWS?

Do we know how to diagnose PCVDs?

YES!!

PMWS diagnosis

- “As a general agreement, the final diagnosis of PMWS is made by clinical history (with a clinical picture compatible with PMWS), presence of characteristic histopathological lesions and detection of PCV-2 in tissues of affected pigs.”

Segalés and Domingo, 1999
 Allen D. Leman Swine Conference

2009: PMWS individual diagnosis

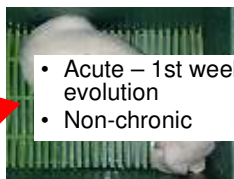
Coupled with a PMWS herd case definition: significant increase of mortality and wasting (www.pcvd.org)



Drawbacks of PMWS herd and individual case definitions

- Individual level:
 - Pathologically oriented – post-mortem!
 - Selection of animals – which are the “good ones” for diagnosis?
 - Do we have an *in vivo* diagnostic alternative?
- Herd level:
 - Comparison to historical levels – do we have retrospective data?
 - Based on an epizootic scenario – is it useful in an enzootic scenario?

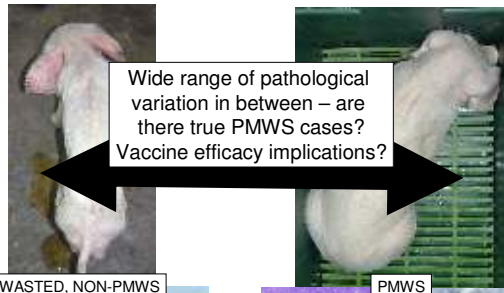
PMWS individual diagnosis: pig selection



- Acute – 1st week of evolution
- Non-chronic

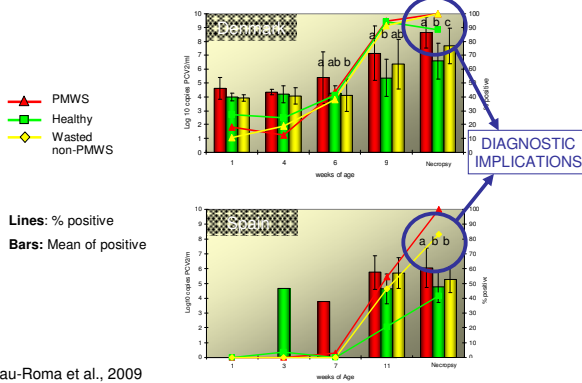


PMWS individual diagnosis: to be or not to be!!



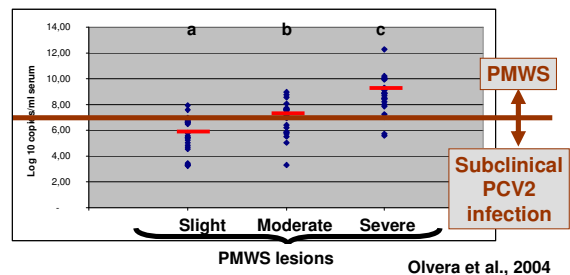
Wide range of pathological variation in between – are there true PMWS cases?
Vaccine efficacy implications?

Do we have an *in vivo* diagnostic alternative? – PCV2 infection dynamics

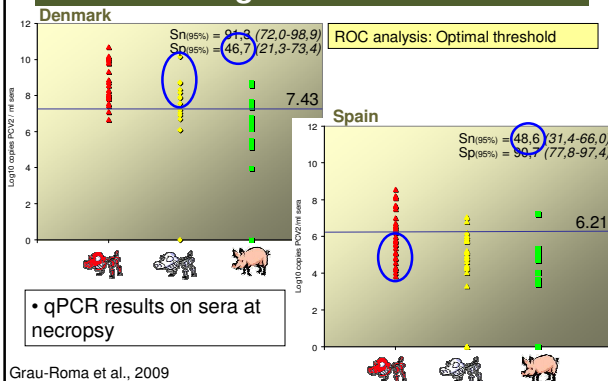


Can quantitative PCR (qPCR) be used as a diagnostic tool for PMWS?

- Maybe as a “group” diagnosis...



Can quantitative PCR (qPCR) be used as a diagnostic tool for PMWS?



HOWEVER, NO DEFINITIVE qPCR "CUT OFF" VALUE HAS BEEN ADOPTED INTERNATIONALLY TO DIAGNOSE PMWS:

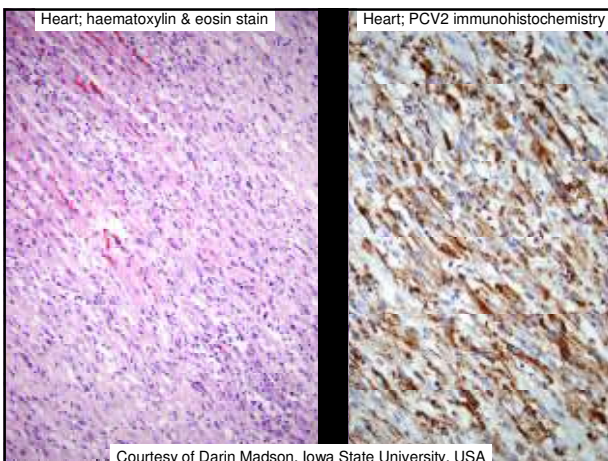
PERFORMANCE COMPARISONS AMONG METHODS?

⇒ RING TESTING

PCV2-associated reproductive failure diagnosis

- Based on the accomplishment of 3 different criteria:
 - Late-term abortions and stillbirths, sometimes with evident hypertrophy of the foetal heart
 - The presence of heart lesions characterized by extensive fibrosing and/or necrotising myocarditis
 - Presence of high amounts of PCV2 in the myocardial lesions and other foetal tissues

Segalés et al., 2005



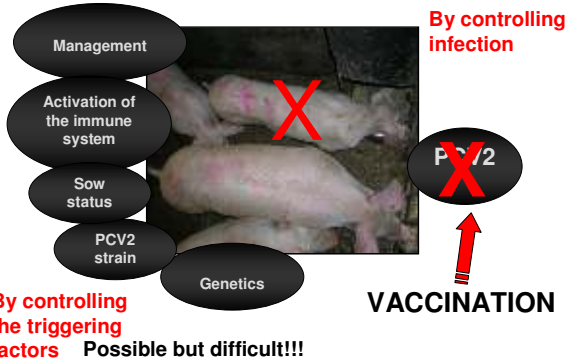
Other potential reproductive effects?

- Zona pellucida-free embryos support PCV2 replication (Mateusen et al., 2004)

Embryonic death?

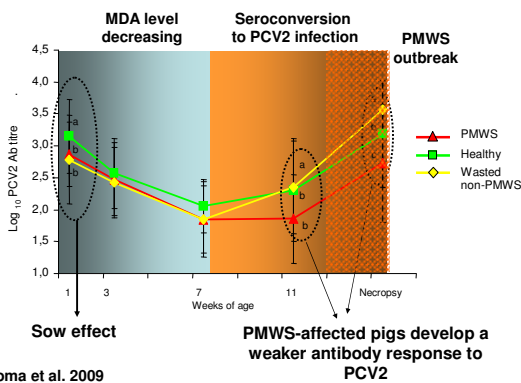
- Return-to-estrus may be a significant effect linked to PCV2 infection of the embryo (Nauwynck et al., 2007)

Controlling PCVDs... first focus, PMWS!!

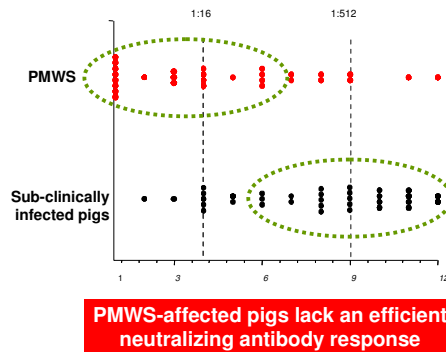


What is relevant for PMWS protection?

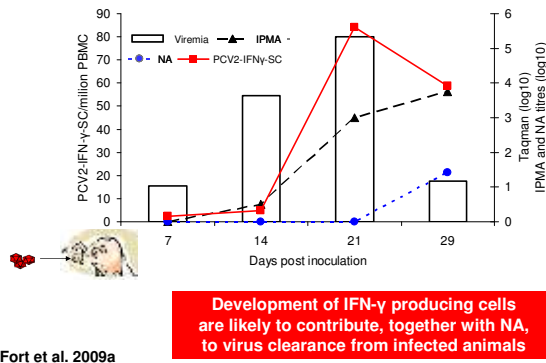
Total antibody dynamics



Neutralising antibodies in PMWS and PCV2 subclinically infected pigs



Cell-mediated immunity dynamics in PCV2 subclinically infected pigs



The immune defences against PCV2 involve both cellular and humoral compartments

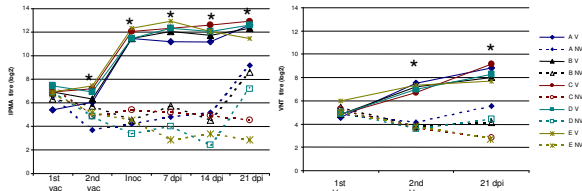
Does it also apply for the vaccine-induced immunity?

PCV2 vaccines elicit detectable humoral immune responses

Vaccinated versus Non-vaccinated pigs

Total antibodies (IPMA)

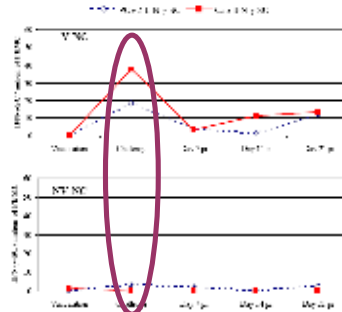
Neutralising antibodies



Fort et al., 2008

PCV2 vaccines elicit detectable cellular immune responses

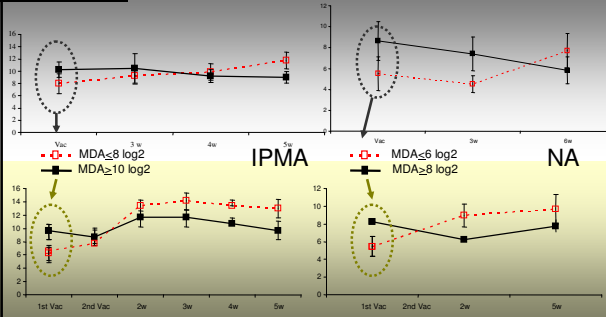
Cellular response (IFN- γ producing cells)



Fort et al., 2009b

Maternal derived immunity: a double edge sword?

Vaccine 1 dose



Vaccine 2 doses

Maternal derived immunity and vaccination: interference?

... with the development of a humoral response after vaccination? **Yes**

Interference clearly depends on the titre at which pigs are vaccinated

IPMA < 8 log₂ (NA < 5.5 log₂) seems **not to interfere** with active seroconversion to vaccination

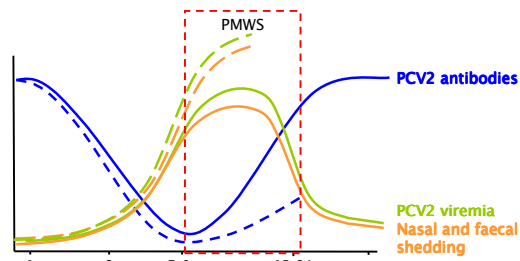
A second dose of vaccine apparently overcome interference with MDA

... with vaccine efficacy? **?**

Probably not!... But... are we getting the best from the vaccine?

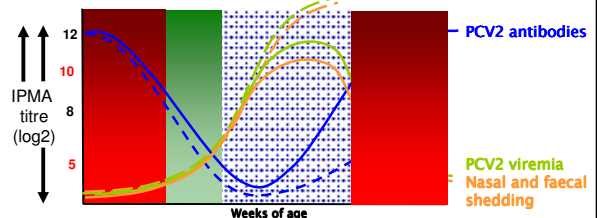
Seroconversion after vaccination is not a necessary condition for protection against PCV2 infection and PMWS
Role of vaccine-induced cell-mediated immunity?

When do we have to vaccinate?



An ideal vaccination strategy should be adapted to the epidemiological situation of each particular herd...
HERD PROFILING!

When do we have to vaccinate?



Vaccination timing

Levels of MDA \checkmark
Weeks of age \times ?

INCREASING INTEREST OF USING PCV2 SEROLOGY?

An alternative to PCV2 piglet vaccination... Sow vaccination!

- Increasing the amount of PCV2 antibodies in the colostrum
- Increasing the amount of PCV2 primed immune cells in the colostrum

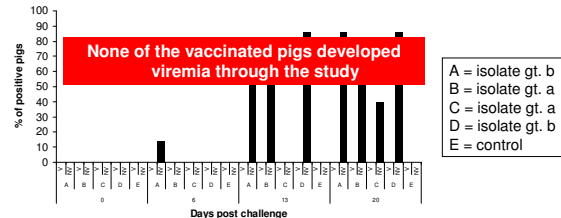
TO CONTROL PMWS

- Can reproductive alterations caused by PCV2 be controlled?

PCV2 vaccination and genotypes

• May vaccines be able to counteract the effect of different PCV2 genotypes?

- Based on field studies, apparently yes (although it has not been studied, really)
- Under experimental conditions, apparently yes as well (Fort et al., 2008)



PCV2 vaccines work...

NewsWatch
Circovirus vaccine to the rescue

By [Name] [Date]

PCV2 is a major cause of Porcine Mortality Syndrome (PMWS) in piglets. A vaccine has been developed that can protect piglets from this disease. The vaccine is based on a live attenuated virus and is highly effective. It is now available for use in commercial pig farms.

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1st European Symposium on Porcine Health Management August 27th – 28th 2009

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www.ecphm.org

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International Symposium on Emerging and Re-emerging Pig Diseases
Barcelona 12-15 June, 2011



**THANK YOU VERY MUCH
FOR YOUR ATTENTION !!!**

