

Maternally-derived antibodies impair piglet humoral and cellular immune responses to vaccination against porcine reproductive and respiratory syndrome

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Fablet C., et al. 2016. Maternally-derived antibodies (MDAs) impair piglets' humoral and cellular immune responses to vaccination against porcine reproductive and respiratory syndrome (PRRS). *Veterinary Microbiology*, **192** : 175-180.

Background (1)

- PRRS vaccination with modified live vaccine (MLV)
 - Decrease of clinical signs in growing pigs (Martelli, 2009)
 - Decrease virus transmission under experimental conditions (Pileri, 2015, Rose, 2015)
 - In the field, difficulties to control PRRSV circulation with MLV vaccines only (Geldhof, 2013)
 - Hypothesis to explain discrepancies between experimental and field conditions
 - Breeding conditions
 - Internal biosecurity
 - Infectious / immune status regarding PRRS at the time of vaccination

➤ Maternally Derived Antibodies (MDA)

Background (2)

- Maternally derived antibodies (MDA)
 - Of 1st importance for piglets during their early life
 - No specific immunity at birth
 - Could interfere with vaccine when administered in piglets. MDA interference with vaccine proven for:
 - Swine: Influenza KV or Aujeszky's disease MLV or KV
(Kitikoon, 2006; Tielen, 1981; Vannier, 1984)
 - Equine viral arteritis (Arterivirus): foal born from immune mares failed to respond to vaccine and died after virulent challenge (Mc Collum, 1976)

Background (3)

- After PRRSV infection
 - Early anti-PRRSV response detected by ELISA
7 - 9 dpi: do not neutralize the virus
 - Neutralizing antibodies (NA) appear from 3 - 4 weeks pi. NA can:
 - Prevent PRRSV infection in passive transfer experiments ([Lopez, 2007](#))
 - Be induced by PRRS MLV in gilts / sows ([Scortti, 2006](#))
 - Be transferred from dam to piglets by colostrum
 - Delay PRRSV infection in piglets ([Geldhof, 2013](#))

Study objectives

- **In this context:**
 - Seem likely that MDA interference with PRRS MLV could exist in piglets.
 - MDA interference could explain in part difference in PRRS vaccine efficacy between experimental and field conditions
- **1/ Primary objective**
 - Investigate the interference of MDA with a PRRS MLV in piglets in terms of humoral and cellular immune responses
- **2/ Secondary objectives**
 - **A/** Assess the natural decrease over time of MDA in piglets
 - **B/** Assess transmission of the vaccine strain between piglets

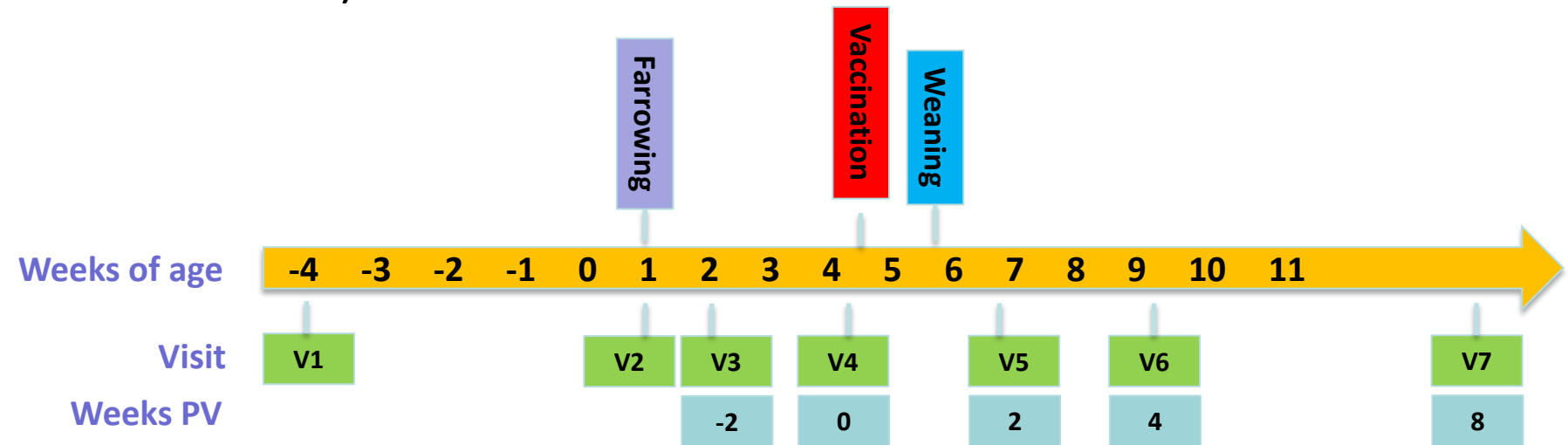
Study design

- Study set-up under field conditions
 - Farrow to finish pig herd
 - No PRRSV circulation
 - Vaccination of dams (Porcilis PRRS IM, Blitz) / No vaccination of piglets
- To achieve the objectives of the study:
 - Identification and follow-up of 4 groups of piglets
 - **A+V+** (n=30): MDNA+ & vaccinated
 - **A-V+** (n=30): MDNA- & vaccinated
 - **A+V-** (n=20): MDNA+ & unvaccinated (isolated): **obj 2A**
 - **Sentinel (A-V-** n=12): MDNA- & unvaccinated: **obj 2B**

} **obj 1**

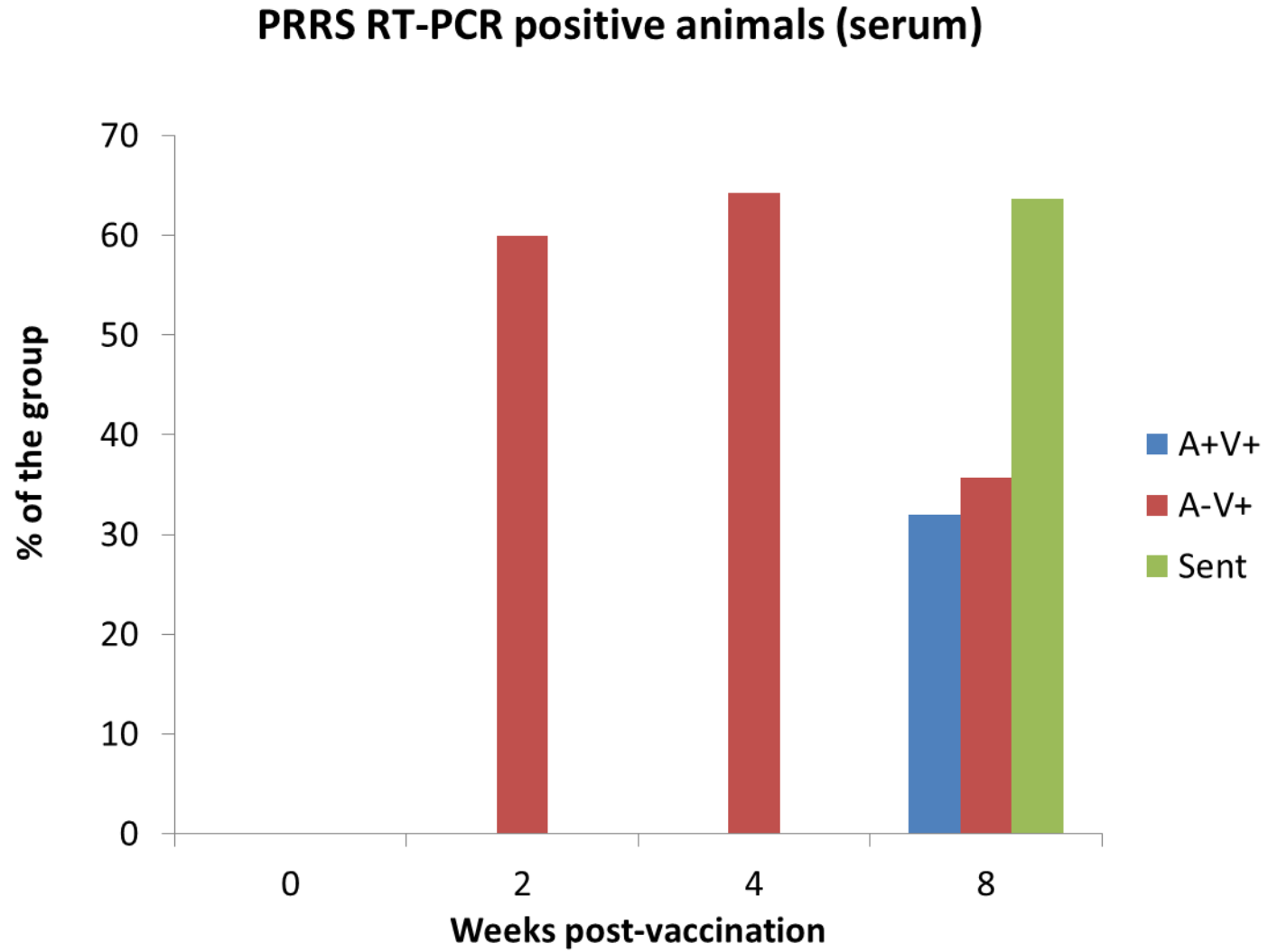
Material & methods

- 7 visits before / after vaccination of piglets (3w of age, Porcilis PRRS ID)

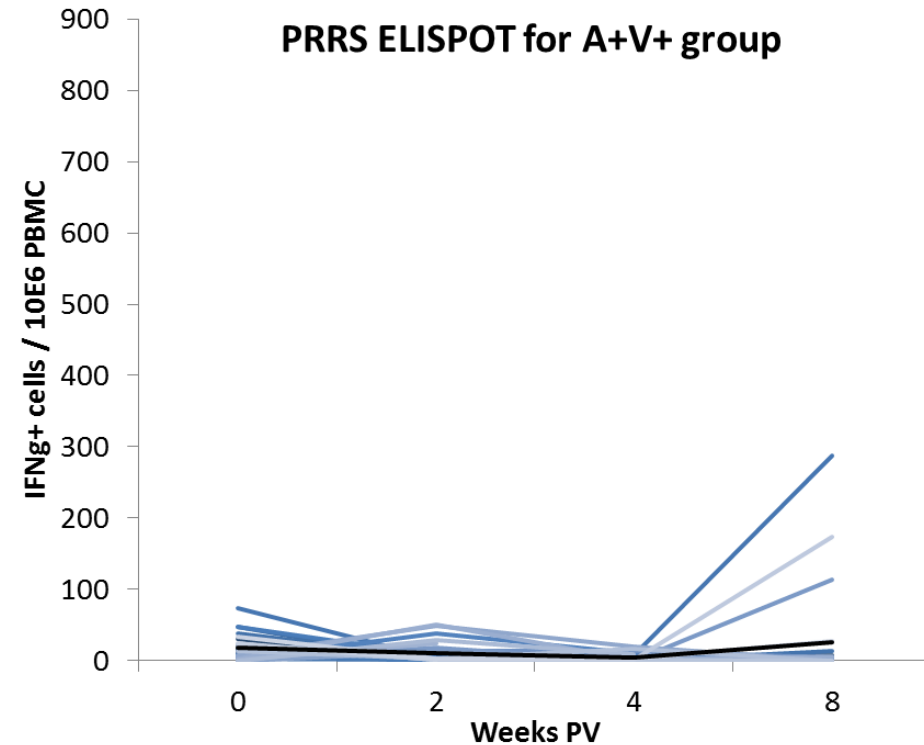
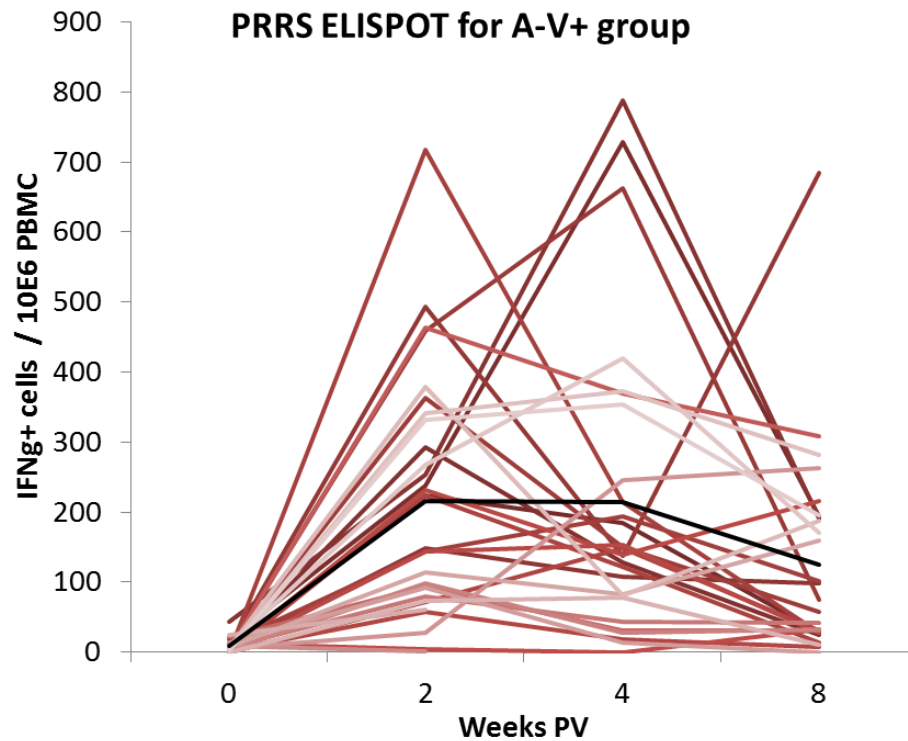


- Blood samples to assess:
 - PRRSV vaccine viremia (RT-PCR + sequencing)
 - Cell mediated immune response (IFN γ ELISPOT)
 - Antibody level (Idexx ELISA + Virus neutralization test)

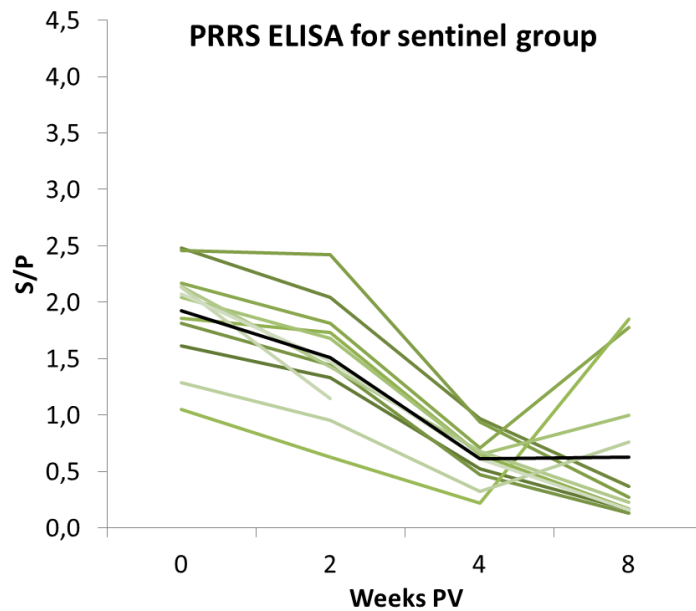
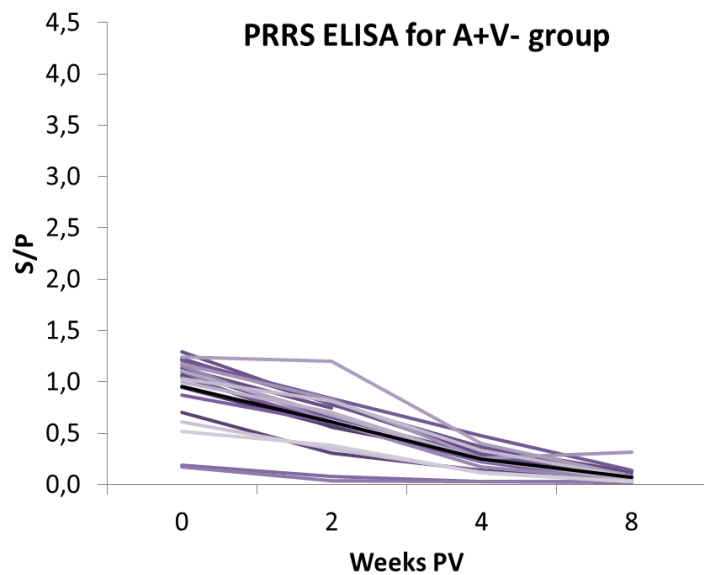
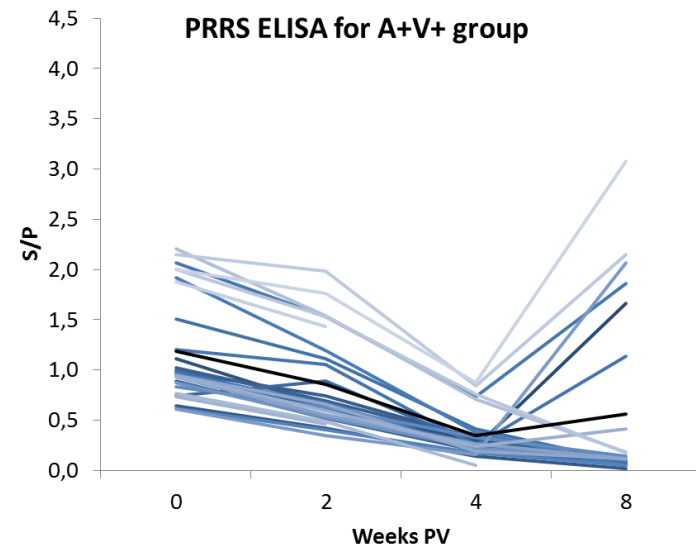
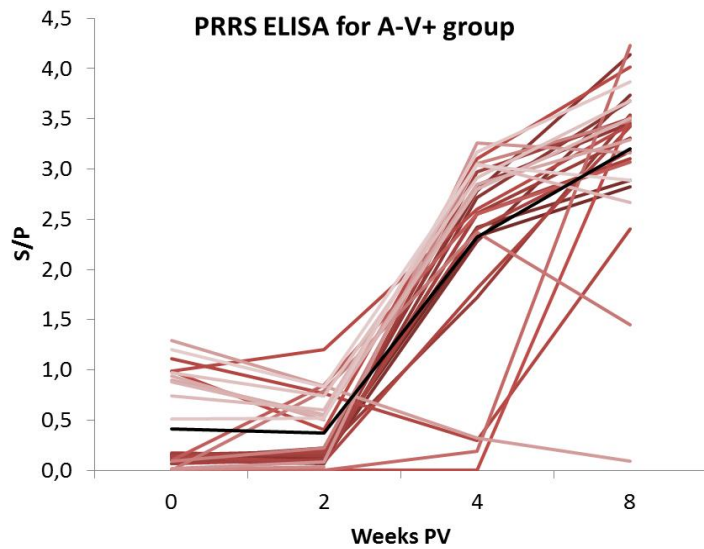
Results: Vaccine viremia



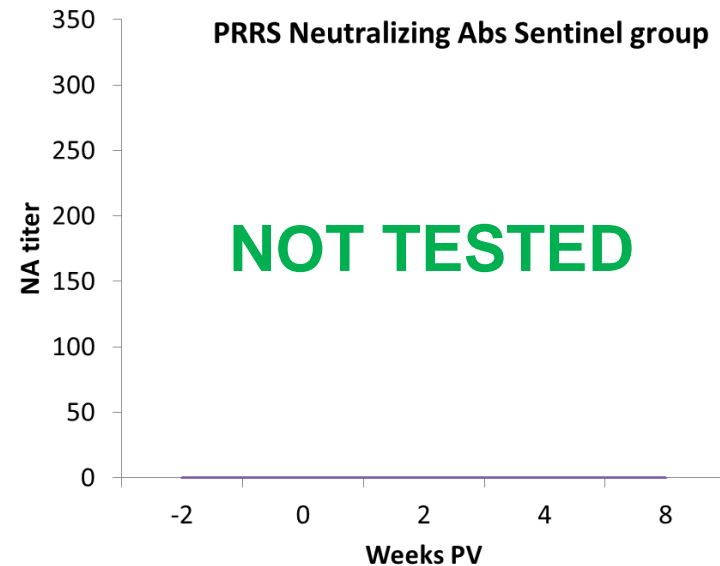
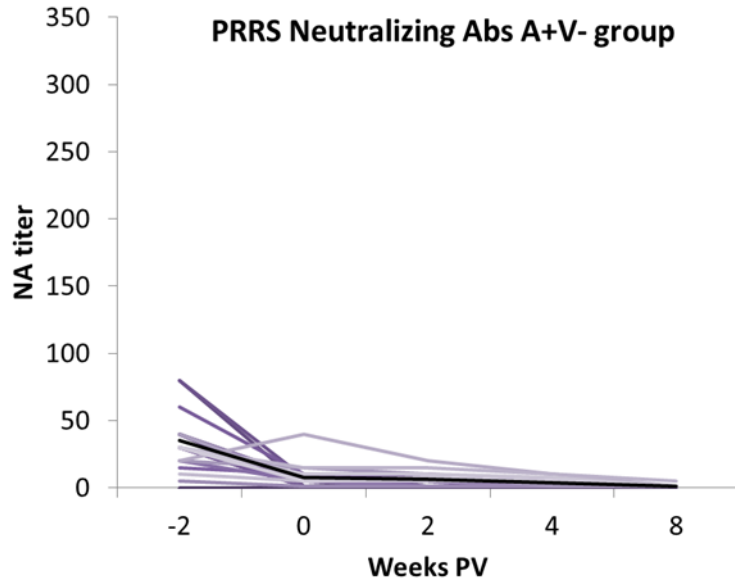
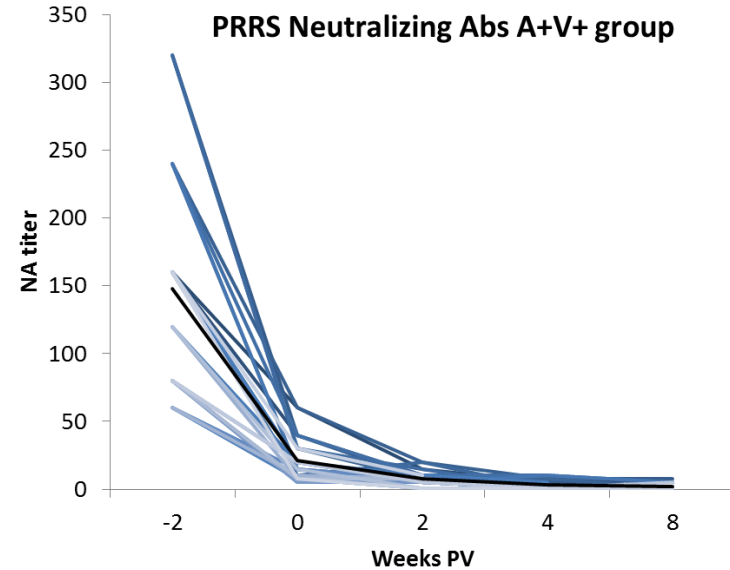
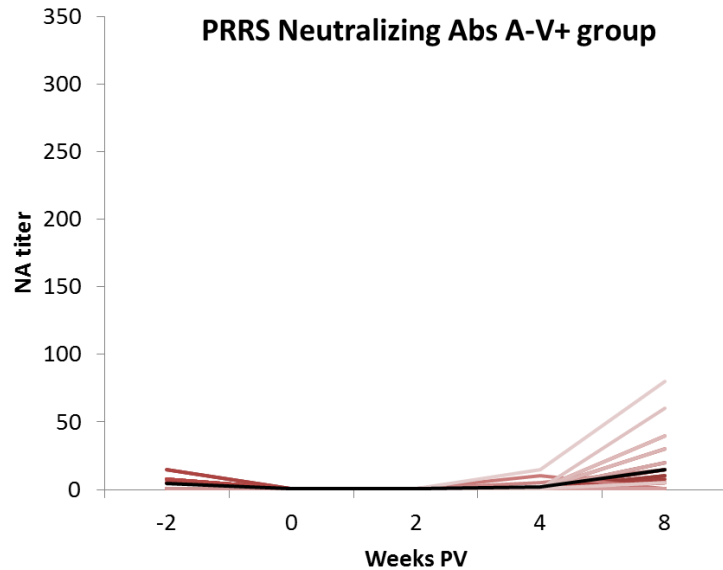
Results: cell-mediated immune response



Results: ELISA antibodies



Results: Neutralising antibodies



Results summary

- **In A-V+ piglets**
 - Expected results after a PRRS MLV vaccination
 - » Vaccine viremia
 - » IFN γ cell immune response
 - » Fast seroconversion detected with ELISA
 - » Delayed detection of NA
- **In A+V+ piglets**
 - No immune response to vaccination at 2 and 4 weeks PV
 - » Hypothesis: neutralization of the vaccine virus by NA → no vaccine viremia, no cell immune response, decay of MDA
 - At 8 weeks PV: detection of the vaccine strain and of the related immune response (same as in sentinel piglets)
- **In A+V- piglets**
 - Natural decay of MDA
 - » At 11 weeks of age, all piglets negative for ELISA and neutralizing Abs
- **In sentinel (A-V-) piglets**
 - At 8 weeks PV: more than 60% of animals PCR+: strong circulation of the vaccine strain

Conclusion and perspectives

- Conclusion
 - First study to demonstrate that MDA (in particular NA) can inhibit cell-mediated and humoral immune response in piglets vaccinated with a PRRS MLV
- Limits
 - No data (yet) on the impact of MDA on vaccine efficacy
- Perspectives
 - Evaluate the impact of MDA on the efficacy of a PRRS MLV in piglets (after a viral challenge): *in progress*
 - » *Clinical and virological parameters*
 - » *Virus transmission*
 - NA but not anti-N Abs (detected by screening ELISA) seems involved in MDA interference with PRRS vaccine
 - » *VN test only available in research lab, need for an easy tool to monitor NA (ELISA)*

Study supported by:



Thank you for your attention

