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Effets immunomodulateurs et antiviraux d'extraits d'algues lors d'une vaccination MLV chez le porc

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BIOEPAR –INRAE, Oniris
Immunologie Clinique des animaux d'élevage

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Context

Porcine reproductive and respiratory syndrome virus (PRRSV) has a strong economic impact on the pig farming sector leading to an overuse of antimicrobial molecules. Live attenuated or inactivated vaccines are effective in reducing symptoms without preventing transmission of the virus.

Seaweed alimentary supplementation is increasingly used in porcine breeding. In this study, we investigated the effect of an *in vivo* seaweed oral supplementation during PRRSV vaccination.

Objectives

The objective is to study the impact of seaweed on immune responses, when given before and/or after vaccination:

- Cytokines concentration levels : Interleukines (IL-1 α , IL-1 β , IL-6, IL-8, IL-10, IL-18, IL-12), Interferon- γ (IFN- γ)
- PRRSV live attenuated vaccine viral genome levels
- Anti-PRRSV IgG antibodies response in the serum

Materials and Methods

Seaweeds :

- Searup^(R): commercial product from OLMIX composed of *Ulva* + Vitamine A (850 000 UI/kg) + Vitamine D3 (200 000 UI/kg) at 1ml/10kg of live weight, diluted in water
- oral delivery 1 day before and 1 day after vaccination (SWpre)
- oral delivery from 1 to 5 days after vaccination (SWpost)

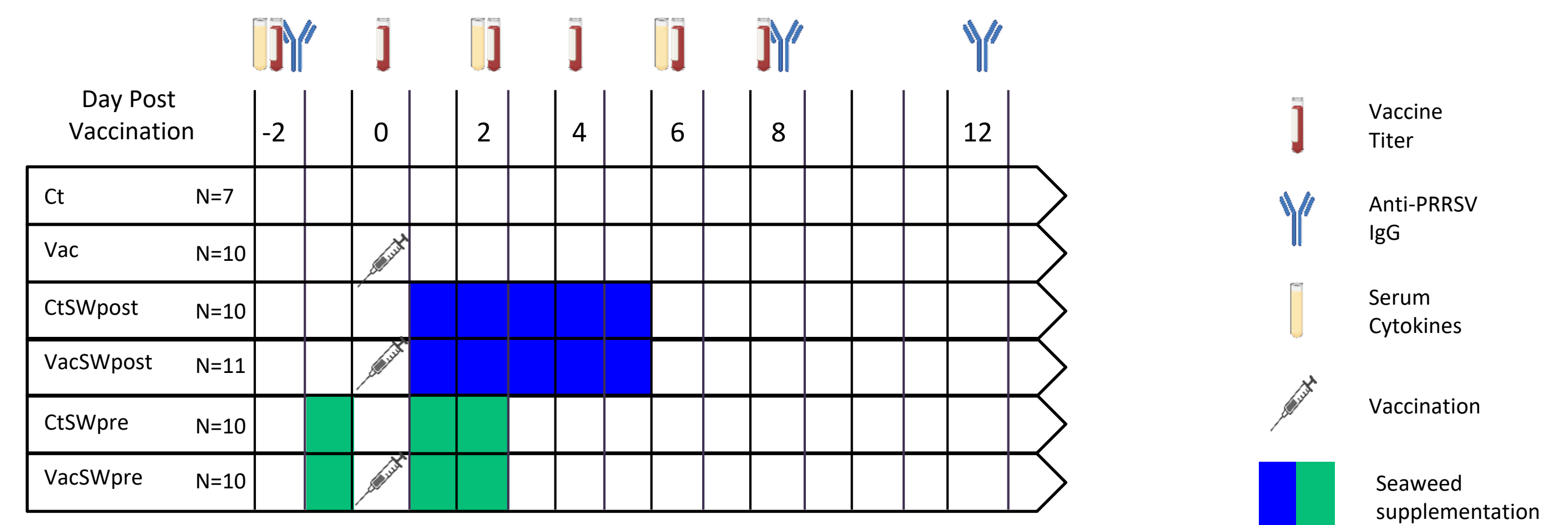
Animals :

- N= 58 : Control Ct (N=7), Vaccinated Vac (N=10), CtSWpost (N=10), CtSWpre (N=10), VacSWpost (N=11), VacSWpre (n=10)
- 10 weeks old conventional animals , 50/50 Male/Female

Vaccine :

- live attenuated vaccine against PRRS MLV, (Ingelvac PRRS MLV (Boehringer Ingelheim®) at day 0 (D0) at 0,5ml/kg, Intramuscular injection

Sampling : serum: Before vaccination : D-2, D0,
After vaccination : D2, D4, D6, D8, D12



Viral load: by Multiplex qPCR PRRSV ORF7 /Beta actine

Detection of IgG antibodies anti-N PRRSV by ELISA IDXX PRRS X3 Ab

Cytokine quantification by Luminex Assay (Millipore Porcine Cytokine kit)

Statistical Analysis (Rstudio) *p* values : * < 0.05

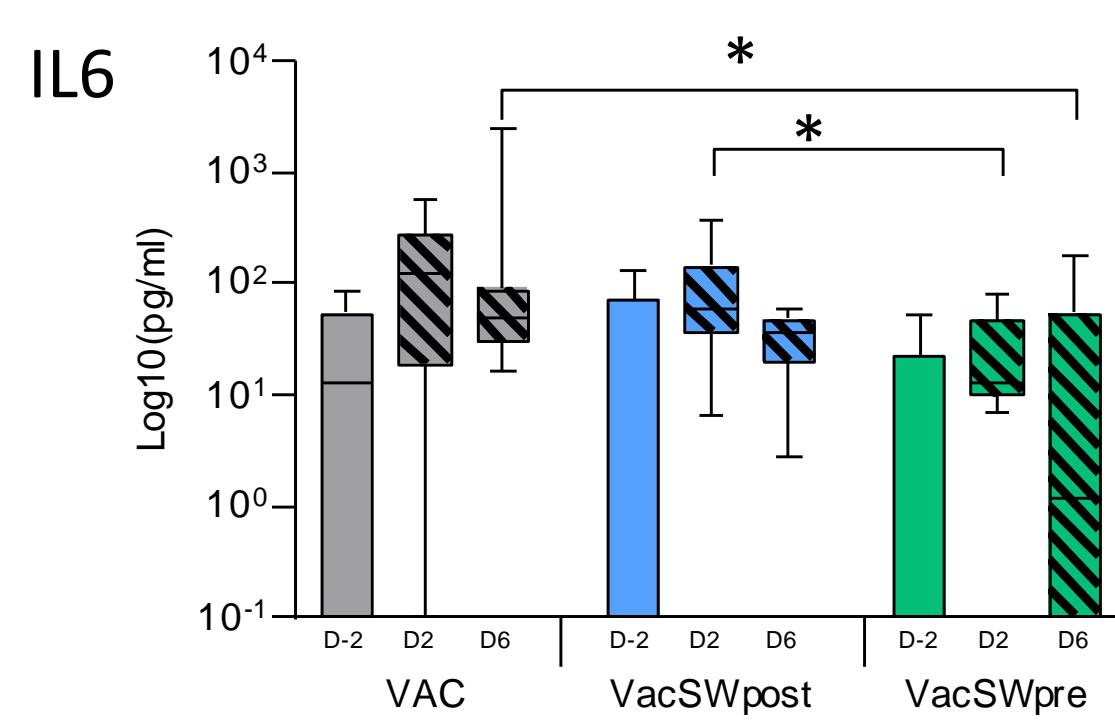
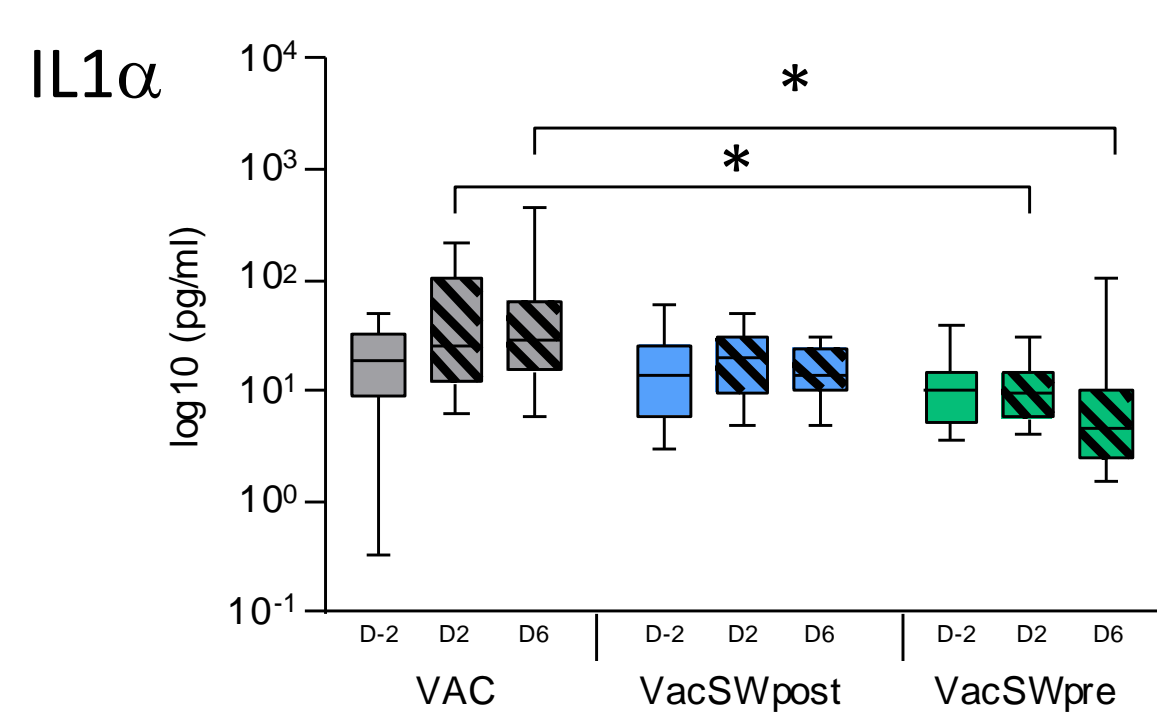
- Inter-groups : Non parametric ranked with Mann-Whitney
- Intra-groups: Wilcoxon pairwise
- Principal Component Analysis : all vaccinated animals

Seaweed supplementation post vaccination :

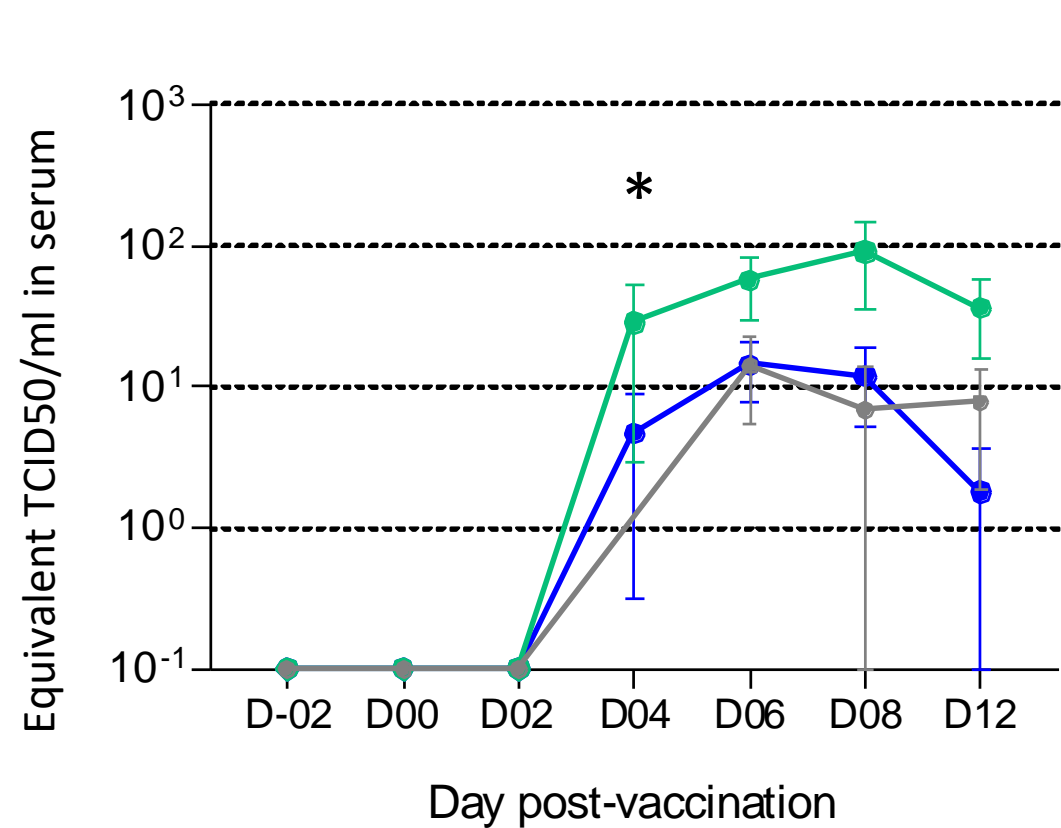
- No significant effect

Seaweed supplementation around vaccination :

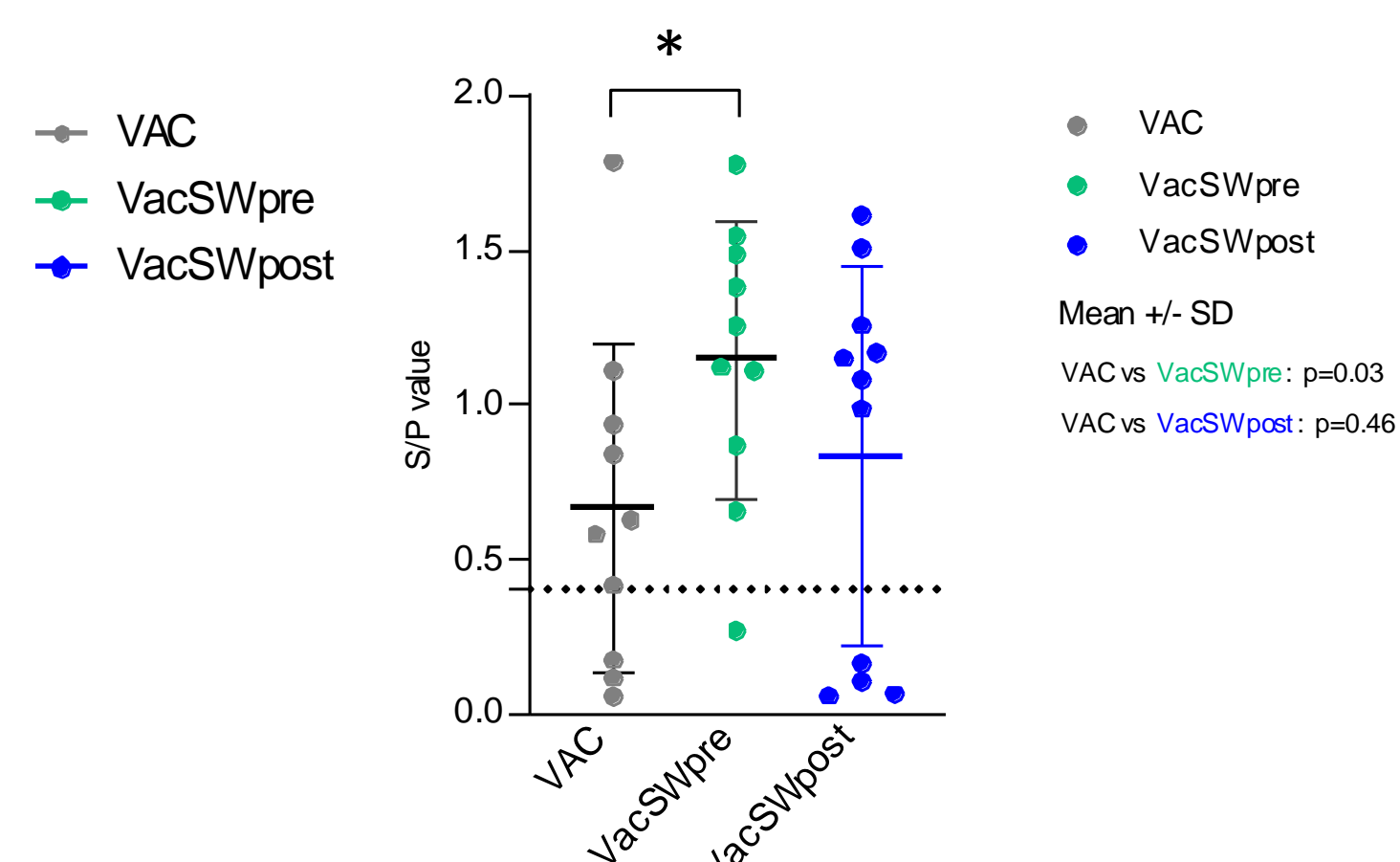
- Modulated systemic inflammation (IL-1 α , IL-6)
- Increased vaccine virus replication
- Improvement of the humoral immune response



Serum PRRSV genomics Loads



IgG anti-PRRSV in serum D12



Results

Principal Component Analysis VacSWpost – VacSWpre - Vac

Biplot Dim1 and Dim2 = 52,3%

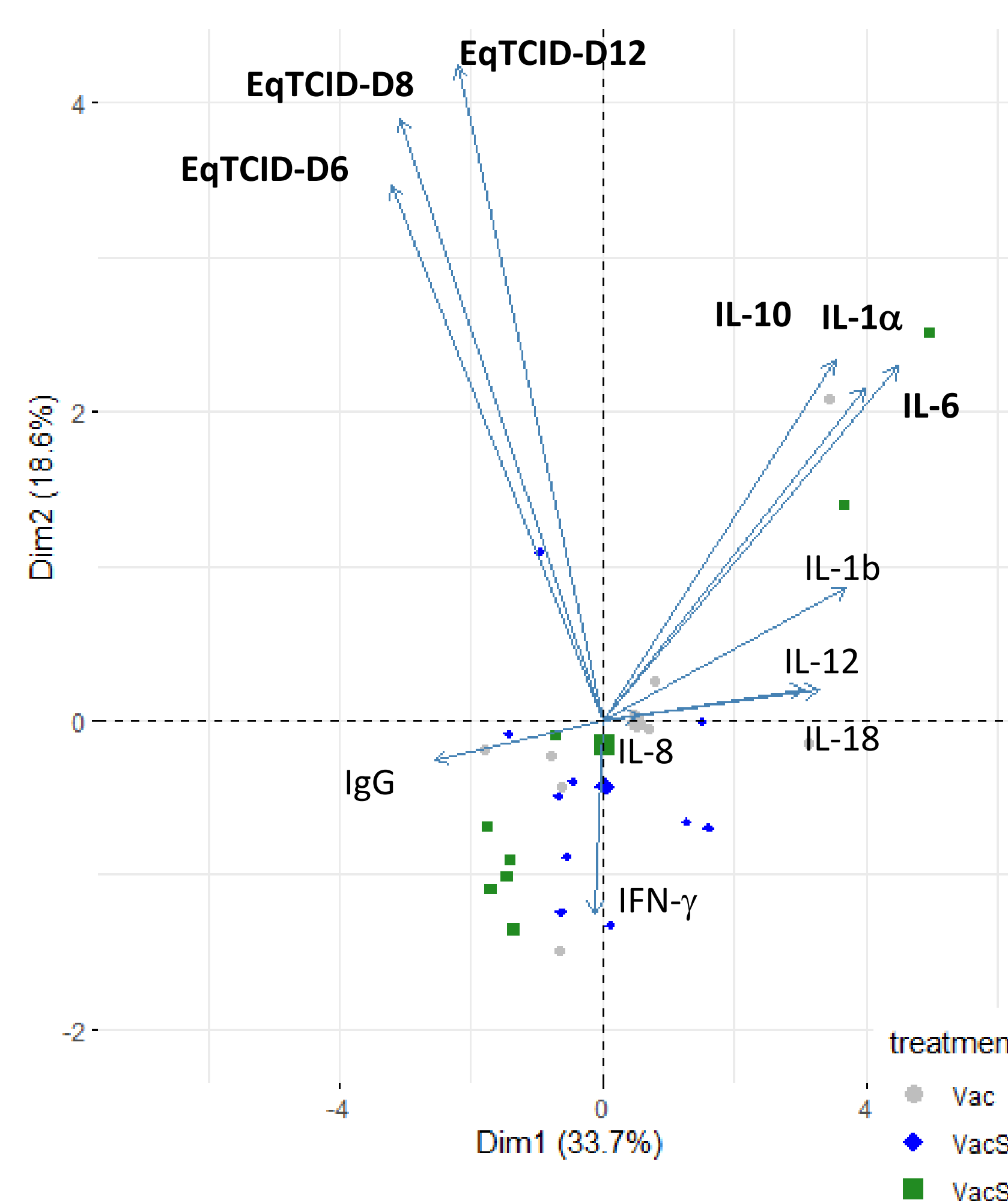


Table showing the quality of the representation (cos²) of a variable on a dimension.

Variables	dpv	Cos2 Dim1	Cos2 Dim2	Cos2 Dim1+Dim2
IL6	6	0,717	0,187	0,904
EqTCID	8	0,335	0,539	0,874
EqTCID	12	0,172	0,638	0,81
EqTCID	6	0,366	0,425	0,791
IL1a	6	0,564	0,165	0,729
IL10	6	0,44	0,194	0,634
IL1b	6	0,485	0,026	0,511
IL12	6	0,385	0,001	0,386
IL18	6	0,331	0,002	0,333
IgG Anti.N.PRRSV	12	0,234	0,002	0,236
IFN γ	6	0,001	0,056	0,057
IL8	6	0,01	0	0,01

The higher the cos², the better the variable is represented by th corresponding dimension.

- IL6, IL1 α and EqTCID explain the variability between VacSWpre and VAC-VacSWpost

Conclusions

Seaweed oral supplementation around vaccination VacSWpre

- Stimulated the anti-PRRSV response : by increasing both vaccine virus replication at day 2 and anti-PRRSV IgG levels at day 12
- Modulating the inflammatory response

Seaweed oral supplementation after vaccination VacSWpost

- No significative effect of SWpost on the anti-PRRSV response
- Vaccinal Virus detected earlier than in the Vac group and for a shorter period
- No significative cytokine modulation

Perspectives

We focused on the immune response, we envisage to :

- Evaluate the clinical and viral protection induced by the **VacSWpre** strategy upon PRRSV challenge,
- Investigate the impact of supplementation on the innate cellular immune response,
- Evaluate the effect of supplementation on PRRSV-infected animals,
- Perform these studies in an experimental facility to reduce variability.