



Veterinærinstituttet
Norwegian Veterinary Institute

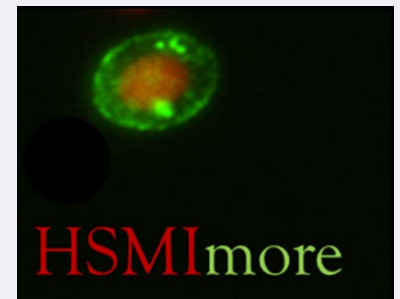


Experimental co-infections of piscine orthoreovirus and salmonid alpha virus in Atlantic salmon (*Salmo salar*)



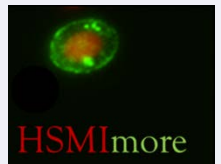
Morten Lund
PhD student

TriNation
Dublin 4th June



HSMImore (FHF901001)

- Project leader
 - Maria Dahle - The Norwegian Veterinary Institute (NVI)
- Project partners
 - Espen Rimstad - The Norwegian University of Life Science (NMBU)
 - Vidar Aspehaug - PatoGen Analyse
 - Sven Martin Jørgensen - NOFIMA
- Funded by the Norwegian Seafood Research Fund (FHF)
- 3 work packages - 3 challenge studies
- WP3 aims to study interactions between piscine orthoreovirus (PRV) and salmonid alphavirus infection in an co-infection challenge
- Magnus Røsæg - PhD-student NMBU



Heart and skeletal muscle inflammation (HSMI)

- The disease differs in severity and lethality between outbreaks.
- HSMI is the viral disease that has been diagnosed most frequently in Norway.
- PRV is ubiquitous along the Norwegian coast and is detected in wild and farmed salmon
- HSMI outbreaks and increased detection of PRV in pre-smolt facilities in 2014

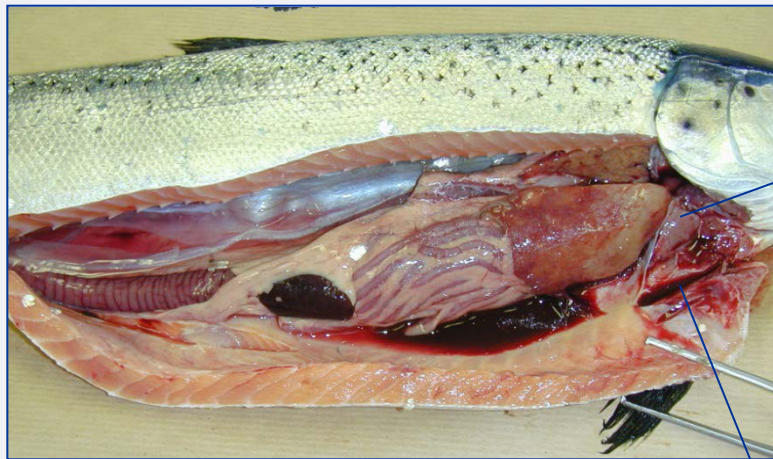
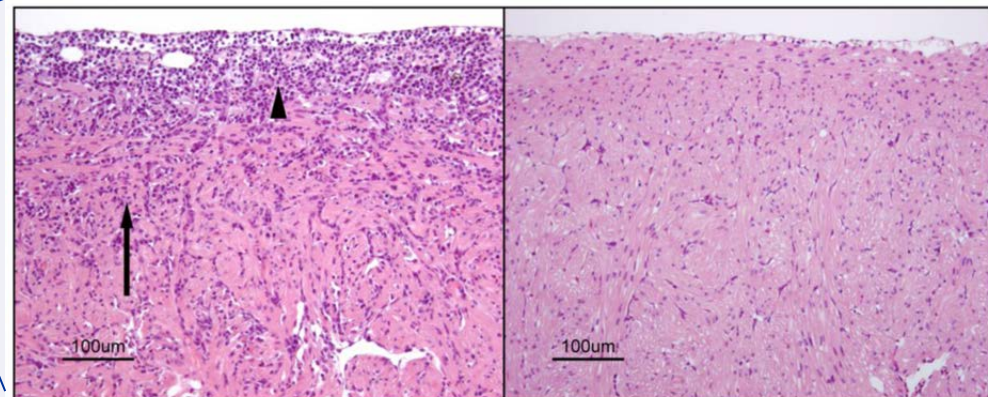


Photo: Trygve Poppe, NMBU



HSMI in pre-smolt

Photo: Morten Lund, NVI

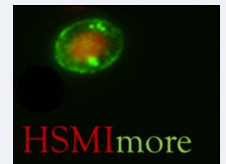
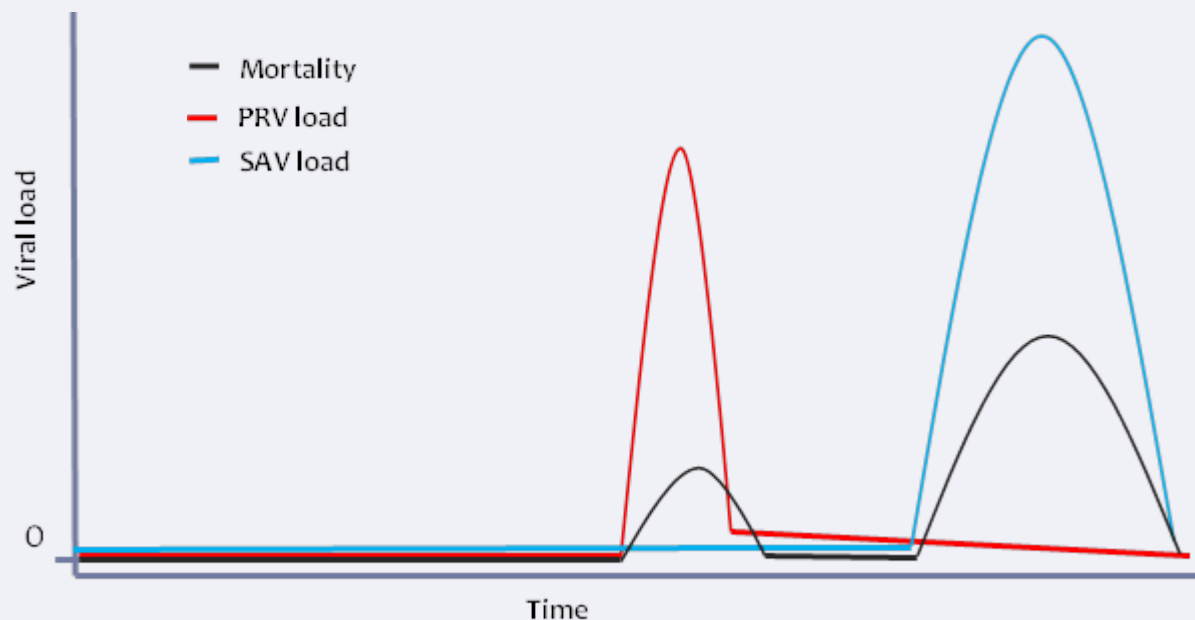


HSMI heart

Healthy heart

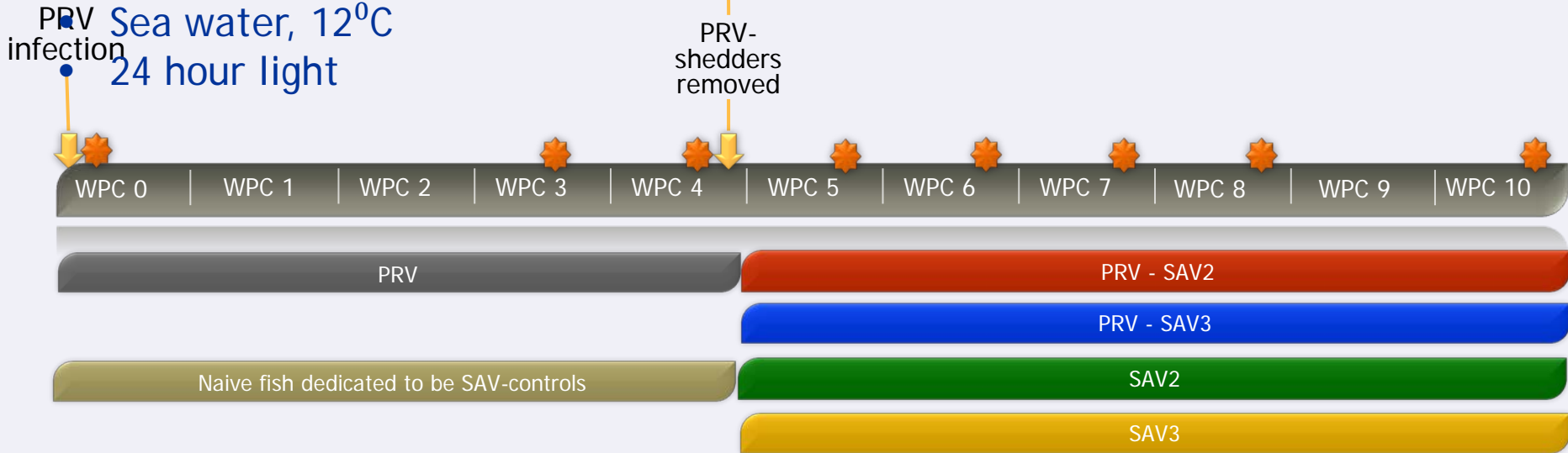
Pancreas disease (PD)

- PD causes great concern in the aquaculture
- Salmonid alphavirus (SAV) subtype 2 and 3
- Co-detection of PRV and SAV in diseased fish with histopathological changes resembling HSMI or PD
- Field observations suspects a connection between PRV and outbreaks of PD



Challenge model - early co-infection

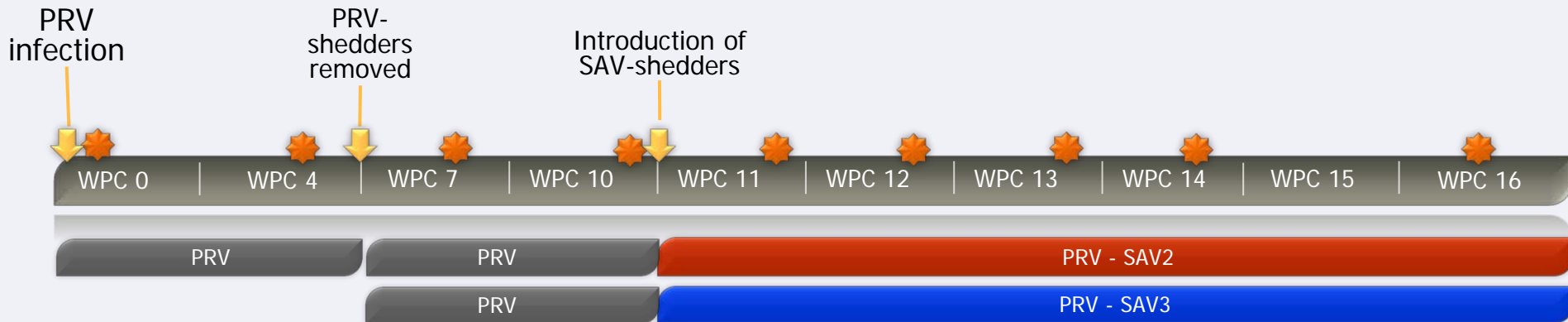
- Atlantic salmon post-smolt
- 80 grams
- Sea water, 12°C
- 24 hour light




✱ Sampling

WPC: Week post PRV-challenge

Challenge model - late co-infection



 Sampling

WPC Week post PRV-challenge

Heparinized blood samples and organs for histopathology and qPCR were sampled

The challenge study was performed at VESO Vikan, Namsos, Norway.

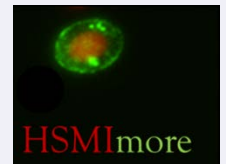
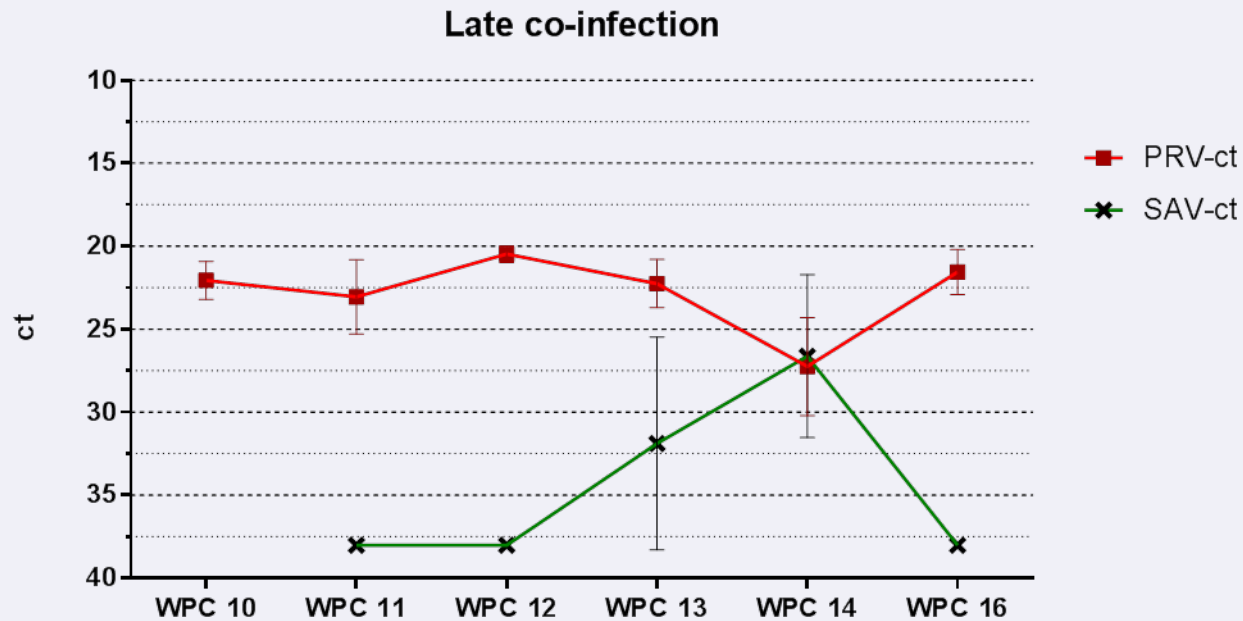
All data presented is from cohabitants

No mortality in any tanks

PRV-SAV2 cohabitants - Blood

ct

Mean ct with 95% CI

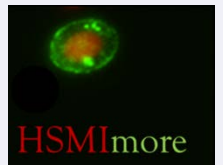


PRV-SAV3 cohabitants - Blood

ct

ct

Mean ct with 95% CI



PRV-SAV2 cohabitants - Heart

ct

ct

Mean ct with 95% CI

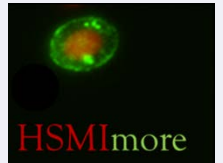


PRV-SAV3 cohabitants - Heart

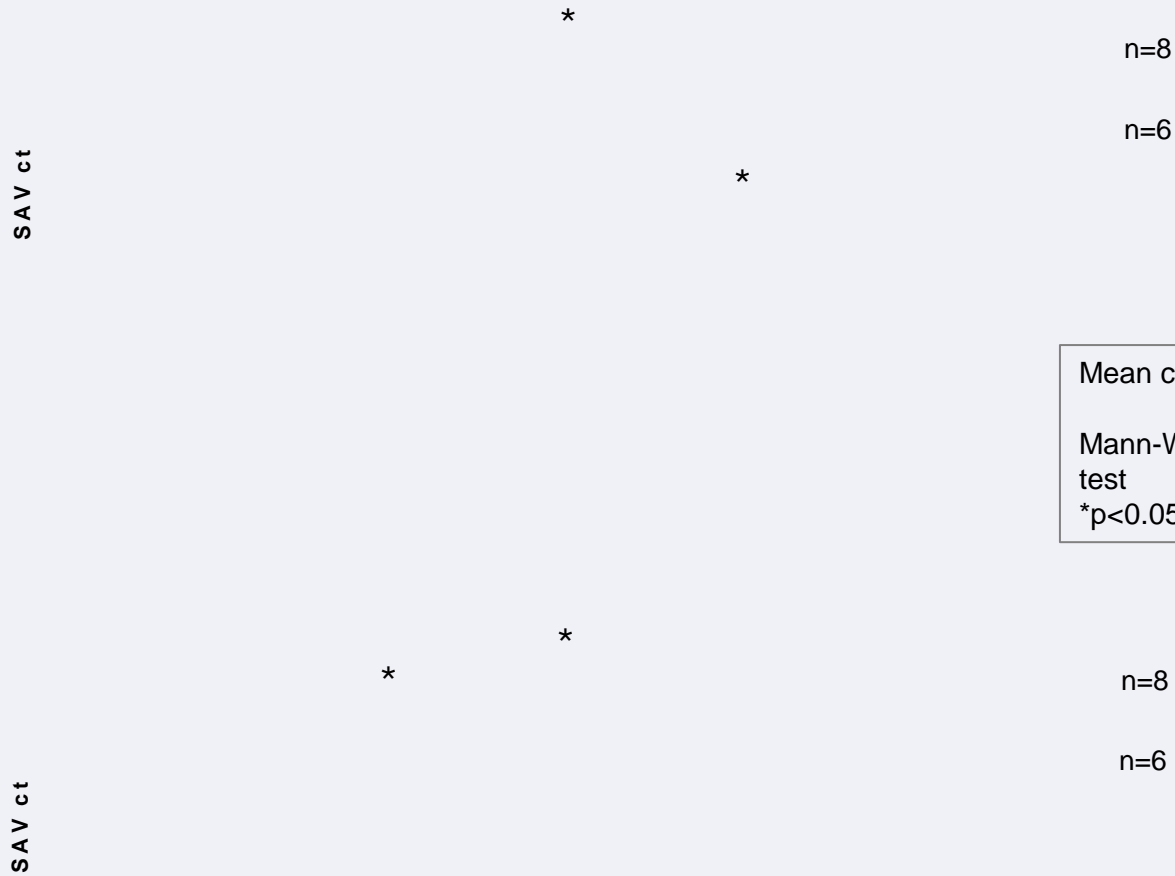
ct

ct

Mean ct with 95% CI

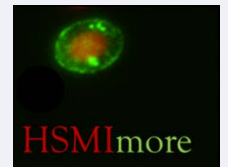


SAV2-kinetics - blood

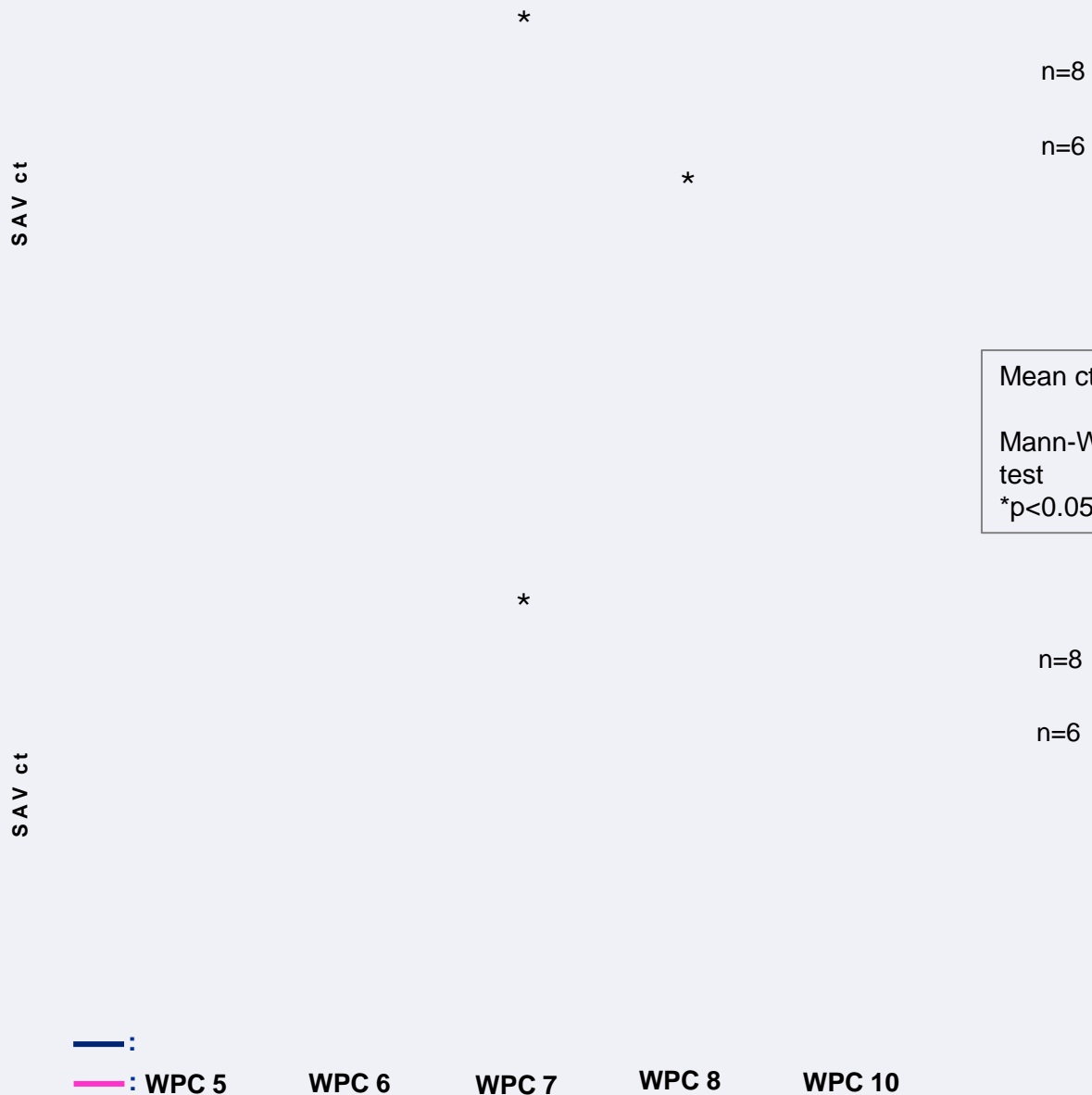


Mean ct with 95% CI
Mann-Whitney, unpaired, rank test
*p<0.05

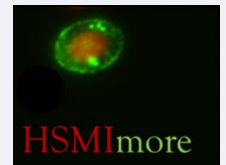
WPC 5 WPC 6 WPC 7 WPC 8 WPC 10



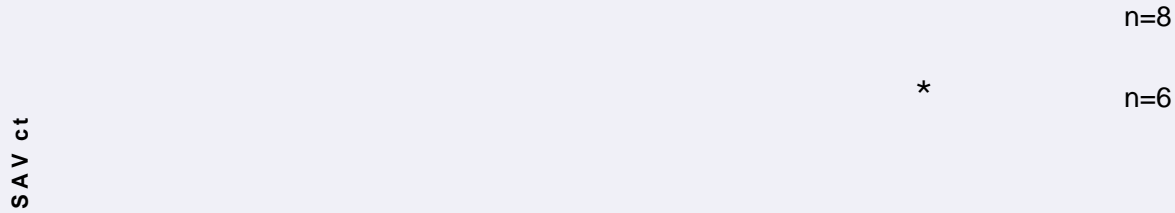
SAV3-kinetics - blood



Mean ct with 95% CI
Mann-Whitney, unpaired, rank test
*p<0.05



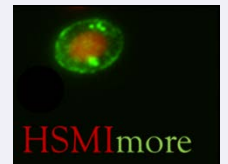
SAV2-kinetics - heart



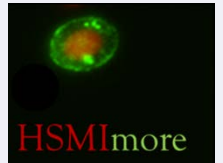
Mean ct with 95% CI
Mann-Whitney, unpaired, rank test
*p<0.05



Legend:
Red line: WPC 5
Green line: WPC 6
Blue line: WPC 7
Purple line: WPC 8
Orange line: WPC 10



SAV3-kinetics - heart



Further analysis

- Histopathology
- Immune gene expression analysis
- Immune response in the heart
- IHC for PRV and SAV in heart and spleen



www.proprofs.com



Conclusions

- SAV infection had no major effects on PRV-kinetics during the co-infection challenge
- PRV most likely suppresses SAV replication
- SAV subtype 3 does not reach peak viral load in the PRV-SAV3 cohabitants compared to SAV2 kinetics in PRV-SAV2 cohabitants



Magnus
Røsæg
PhD-
student

Øystein
W Finstad
Post-doc

Hanne
Haatveit
PhD-
student

Morten
Lund
PhD-
student

Ingvild
Nyman
Engineer

Maria K
Dahle
Senior
researcher

Espen
Rimstad
Prof.
virology

