

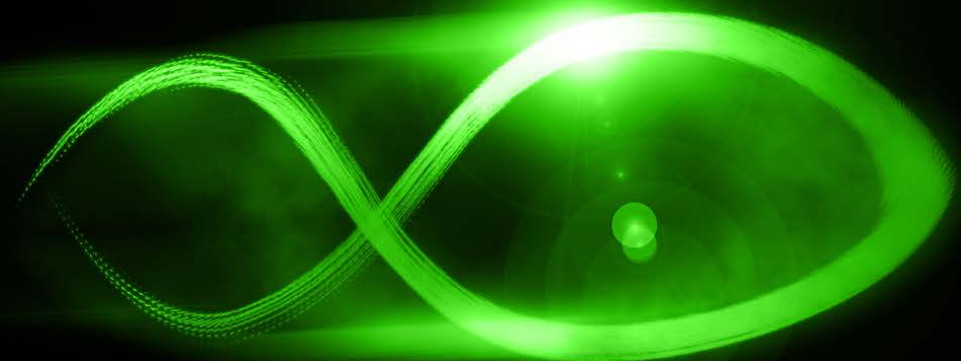
Sustainable Performance

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PD vaccination protects against SPDV subtypes 2 and 3

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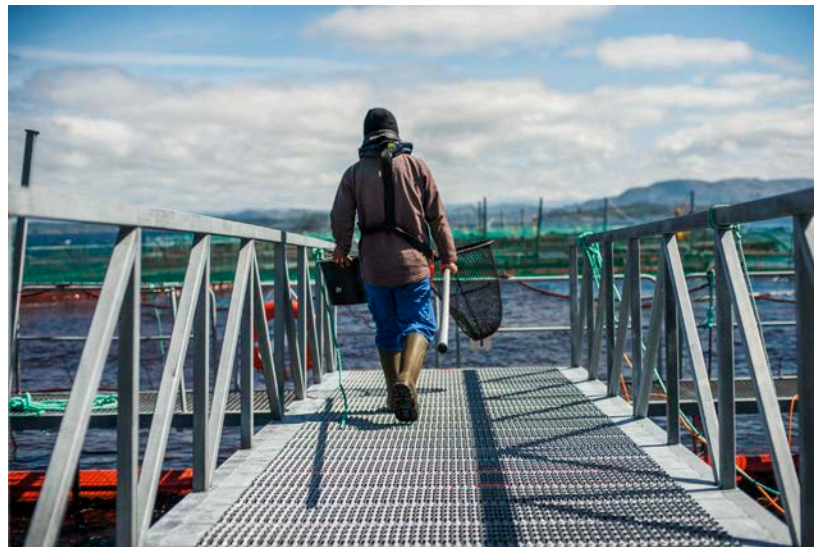
The cause of Pancreas disease (PD) can descend from different isolates

- **PD is a disease caused by salmon pancreas disease virus (SPDV = SAV)**
 - Affects Atlantic salmon (*Salmo salar*) and Rainbow trout (*Oncorhynchus mykiss*)
 - Isolates can be separated by sequencing parts of the E2 protein (genotyping)
 - Current isolates cannot be separated by serology
- **There are 6 genetical groups of isolates (subtypes) known as: SAV-1, SAV-2, SAV-3, SAV-4, SAV-5 og SAV-6**
 - SAV-1,-4,-5 og -6 isolates: Endemic in Ireland og Scotland
 - SAV-2 isolates: Endemic in France, Norway (north of Hustadvika) and Shetland
 - SAV-3 isolates: Endemic in Norway (south of Hustadvika)



There is only one serotype of the PD-virus

- **Genotype (subtype of SAV):** separated with use of genetic analysis
- **Serotype:** Separated by antibodies that detect variations on the surface proteins



PD vaccination is efficacious against all known genotypes

- A comparative cross-neutralization studies from 2013 of the six recognized SAV genotypes shows that :
 - **The six genotypes are the same viral species**
 - **The humoral immunessystem of the fish will recognize all SAV isolates as the same**
 - **A vaccine based on one isolate will protect against PD caused by a different isolate, independently of their subtype grouping**

Cross-neutralization studies with salmonid alphavirus subtype 1–6 strains: results with sera from experimental studies and natural infections.
Graham et.al. *Journal of Fish Diseases* 2013



The severity of the disease varies with the genotypes

- Some differences are found in the dynamic of infection among the six genotypes:
 - **SAV 1 & 3 isolates showed synchronic infection of cohabitating fish, in addition to the highest viral load in heart tissue, and most severe histopathological changes**
 - **SAV 2 & 6 isolates showed asynchronous infection in cohabitating fish, and a slower viral spread, lower viral load and milder histopathological changes**
 - **Only one isolate per subtype was included in this study, therefore results cannot generalize all potential isolates**
 - **There is probably variations both between, and inside, the subtype groupings**

Graham DA, Frost P, McLaughlin K, Rowley HM, Gabestad I, Gordon A, McLoughlin MF (2011) *A comparative study of marine salmonid alphavirus subtypes 1–6 using an experimental cohabitation challenge*. J Fish Dis 34: 273–286



The severity of the disease varies with the genotypes

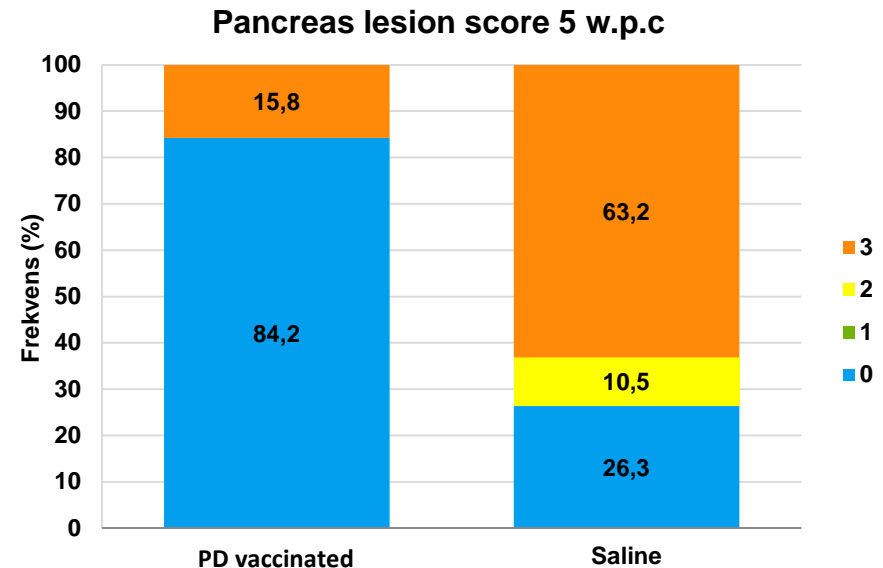
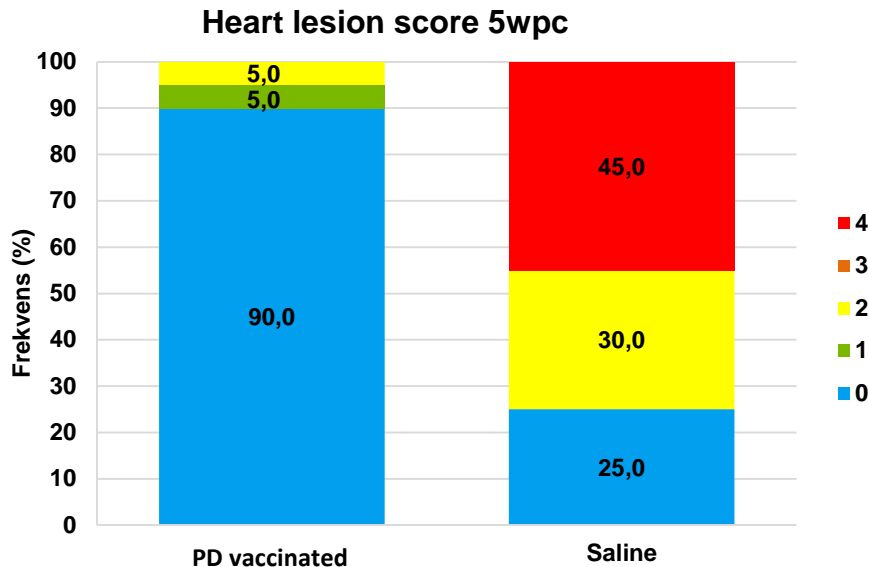
- Mortality and weight loss in Atlantic salmon were studied in a cohort challenge trial with three Norwegian SAV3 and three Norwegian SAV2 isolates:
 - SAV2 isolates showed a tendency of lower prevalence and severity of pathological changes
 - There was difference in virulence between the isolates within each subtype

Taksdal T, , Bang Jensen B, Bockerman I, McLoughlin MF, Hjortaaas MJ, Ramstad A, Sindre H, (2014) *Mortality and weight loss of Atlantic salmon, *Salmo salar* L., experimentally infected with salmonid alphavirus subtype 2 and subtype 3 isolates from Norway.* J Fish 2014



PD vaccination reduces disease and severity of PD specific lesions following SAV3 challenge

Cohabitant challenge with SAV3 isolat



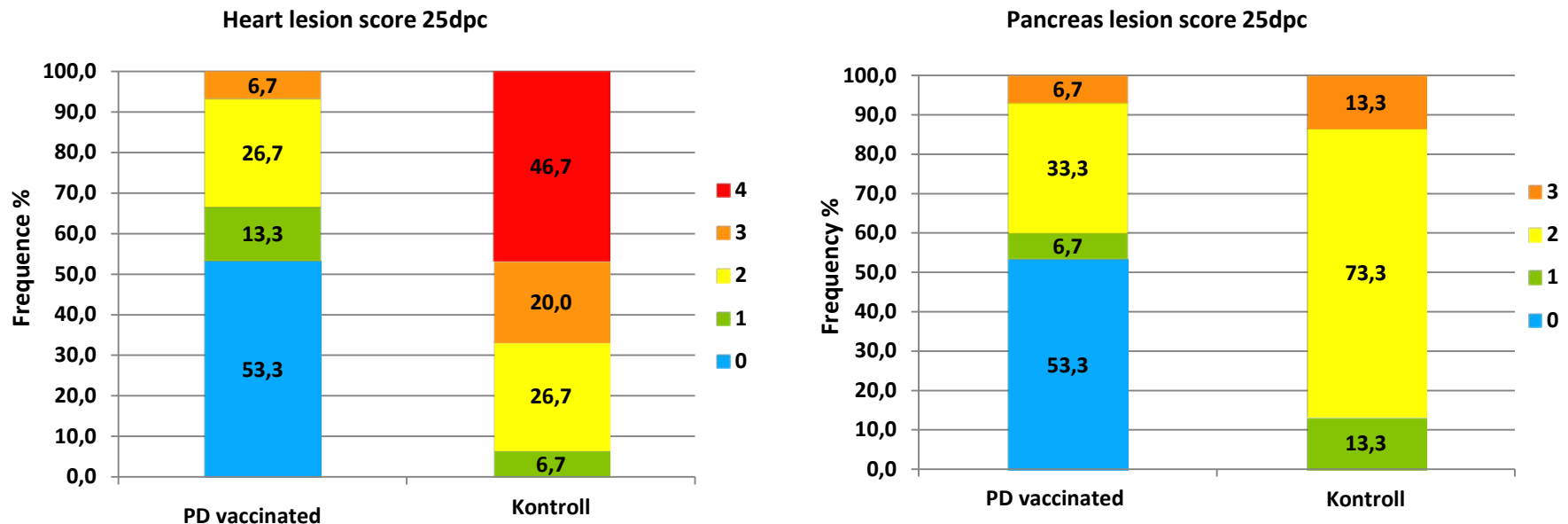
Histopathology:

Significant reduction of PD specific histopathological heart and pancreas lesions 5 weeks post PD challenge.

5% of the PD vaccinated group had PD specific lesions in heart, while 75% of the unvaccinated group had PD specific lesions in heart.

PD vaccination reduces disease and severity of PD specific lesions following SAV2 challenge

Cohabitant challenge with SAV2 isolate



Histopathology:

Significant reduction of PD specific histopathological heart and pancreas lesions 26 days post PD challenge.

33,4% of the PD vaccinated group had PD specific lesions in heart, while 93,3% of the unvaccinated group had PD specific lesions in heart.

PD vaccination reduces prevalence of SPDV positive sera after cohabitation challenge

PD vaccinated	Injection dose (ml)	PD challenge	Prevalence of SPDV positive sera at 21dpc (Ct below 35) (12°C)	% RPP (relative percent protection)
Yes	0,1	SAV3	1/35 (2,8%)	96,4
No	0,1	SAV3	28/35 (80%)	-

PD vaccinated	Injection dose (ml)	PD challenge	Prevalence of SPDV positive sera at 17dpc (Ct below 35) (15°C)	% RPP (relative percent protection)
Yes	0,1	SAV2	3/25 (12%)	83,3
No	0,1	SAV2	18/25 (72%)	-

Peak viremia

Summary

- **The humoral immunessystem of the fish will recognize all SPDV/SAV isolates as the same, independently of their subtype grouping**
- **It is shown that a vaccine based on one isolate (e.g SAV1 isolate) will protect against PD caused by a different isolate (e.g SAV2 isolate or SAV3 isolate) by reducing disease and the severity of histopathological lesions in heart and pancreas**

Referances

- Graham et.al. Cross-neutralization studies with salmonid alphavirus subtype 1–6 strains: results with sera from experimental studies and natural infections. *Journal of Fish Diseases* 2013
- Graham DA, Frost P, McLaughlin K, Rowley HM, Gabestad I, Gordon A, McLoughlin MF (2011) *A comparative study of marine salmonid alphavirus subtypes 1–6 using an experimental cohabitation challenge*. *J Fish Dis* 34: 273–286
- Taksdal T, , Bang Jensen B, Bockerman I, McLoughlin MF, Hjortaas MJ, Ramstad A, Sindre H, (2014) *Mortality and weight loss of Atlantic salmon, *Salmo salar* L., experimentally infected with salmonid alphavirus subtype 2 and subtype 3 isolates from Norway*. *J Fish* 2014

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