

Efficacy of DNA vaccine expressing the nonstructural proteins of PRV

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History of HSMI-PRV infection









History of HSMI-PRV infection





Demonstration of a causal relationship between PRV and HSMI (*Wessel et al 2017*)



Pure PRV particles induce HSMI

Heart



Injected 4 wpc



8wpc

Cohabitants

8wpc







Replicon vector: The use of PD virus as a vaccine vector



The use of PD virus machinery as a vaccine vector



The use of PD virus machinery as a vaccine vector



The use of PD virus machinery as a vaccine vector







DNA constructs made

Vaccination trial #I

Group	Vector	Vaccine
1	pSAV	μNS
2	pSAV	$\mu NS + \sigma NS$
3	pSAV	$\mu NS + \mu 2 + \sigma NS + \sigma 2 + \lambda 1 + \lambda 3$
4	pSAV	$\mu NS + \mu 1 + \sigma NS + \sigma 1 + \sigma 3 + \lambda 2$
5	pSAV	$\mu NS + \mu 1 + \mu 2 + \sigma NS + \sigma 1 + \sigma 2 + \sigma 3 + \lambda 1 + \lambda 2 + \lambda 3$
6	pcDNA3.1	$\mu NS + \sigma NS + \sigma 1$
7	pSAV	EGFP (control)







Trial setup



B

Fish and management	Vaccination trial #I	Vaccination trial #II		
Species	Atlantic salmon (Salmo salar)			
Strain	SalmoBreed Standard	Stofnfiskur		
Origin	VESO Vikan Hatchery			
Average weight	25-35 grams			
Physiological status	Presmolts			
Number of fish	290 + 20 % shedders	166 + 20 % shedders		
Salinity	Fresh water during immunization/Salt water during challenge			
Stocking density	Max 50 kg/m ³			
Temperature	$12^{\circ}C \pm 1^{\circ}C$			



PRV RNA load in blood cells.



- pSAV μNS
- **pSAV** μ NS + pSAV σ NS
- **p**SAV μ NS + pSAV σ NS + Core
- **pSAV** μ NS + pSAV σ NS + Capsid
- **b** $pSAV \mu NS + pSAV \sigma NS + Capsid + Core$
- **p**cDNA3.1 μ NS + pcDNA3.1 σ NS + pcDNA3.1 σ 1
- pSAV EGFP



Histopathological score in epicard.



Grown	0 wpc		4 wpc		6 wpc		8 wpc		10 wpc	
Group	Epicard	Ventricle								
1	0,0	0,0	0,0	0,0	0,7	0,8	1,7	2,0	1,5	1,7
2	0,0	0,0	0,0	0,0	1,0	1,8	2,0	2,7	1,2	1,7
3	0,0	0,0	0,0	0,0	1,7	2,5	1,5	2,2	1,0	0,8
4	0,0	0,0	0,0	0,0	1,3	1,7	1,2	1,5	0,8	0,8
5	0,0	0,0	0,0	0,0	1,7	1,5	0,8	1,2	0,8	1,2
6	0,0	0,0	0,0	0,0	0,3	0,5	0,0	0,0	0,5	0,5
7	0,0	0,0	0,0	0,0	1,2	1,0	2,7	3,3	0,7	1,2



DNA constructs made. Trial II

Vaccinati	ion trial #II	
Group	Vector	Vaccine
1	pcDNA3.1	$\mu NS + \sigma NS + \sigma 1$
2	pcDNA3.1	$\mu NS + \sigma NS + \sigma 3$
3	pcDNA3.1	$\mu NS + \sigma NS$
4	pcDNA3.1	μNS
5	pcDNA3.1	EGFP (control)
6	pcDNA3.1	PBS (control)





PRV RNA load in blood cells and plasma Trial II

- Group 1: pcDNA3.1/ μ NS + σ NS + σ 1
- Control: pcDNA3.1/EGFP
- Control: PBS





Histopathological score in epicard. Trial II



Group 1: pcDNA3.1/ μNS + σNS + σ1
Group 2: pcDNA3.1/μNS + σNS + σ3
Group 3: pcDNA3.1/μNS + σNS
Group 4: pcDNA3.1/μNS

Control: pcDNA3.1/EGFP

Control: PBS

• Group 1: pcDNA3.1/ μ NS + σ NS + σ 1

Control: pcDNA3.1/EGFP

Control: PBS



B

Group	6 wj	oc	8 wpc		
Group	Epicardium	Ventricle	Epicardium	Ventricle	
1	0,3	0,3	1,0	2,5	
2	1,2	1,3	1,7	2,2	
3	0,6	0,7	1,6	2,0	
4	0,7	0,8	1,4	1,9	
5	0,7	0,3	2,5	4,0	
6	0,0	0,0	2,1	4,0	



Summary

- Two experimental vaccination trials with DNA vaccines expressing different combinations of PRV proteins,
- Expression of the non-structural proteins μNS and σNS induced moderate protection against HSMI.
- Expression of μNS and σNS combined with the cell attachment protein σ1, induced a protective effect against HSMI.





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Thank you for your attention