



# ILA vaksine – forskningsnytt

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NMBU- Veterinærhøgskolen



## Ultimate fish vaccine – requirements?

- Efficient
  - Induce disease protection
  - Reduce/stop shedding
  - Long-lasting immunity
  - Administrated once
- Safe
  - No/little side effects
  - No/little environmental effects
  - No effect for consumer
- Low cost?
- Easy to administrate
  - Injectable versus oral or dip?

- ViVaFish is a platform project funded by Research Council of Norway (RCN)



Primary institutions



National and international partners

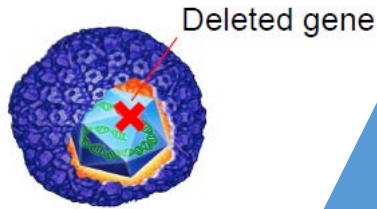
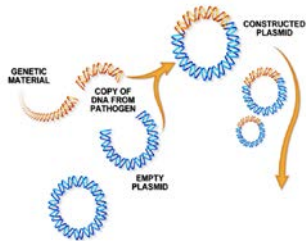


Unité de Virologie et Immunologie Moléculaires



Industrial partners

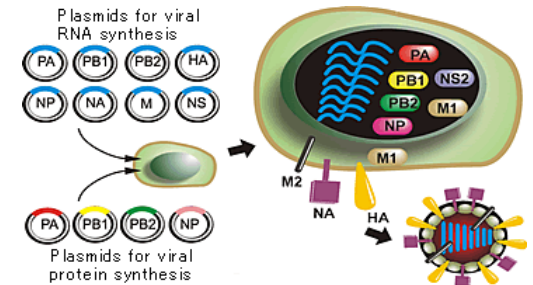
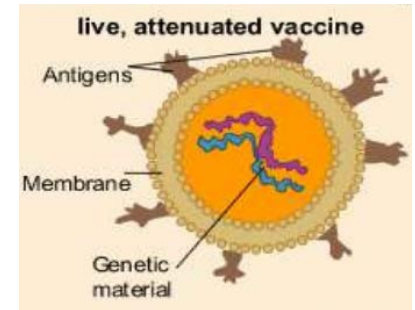
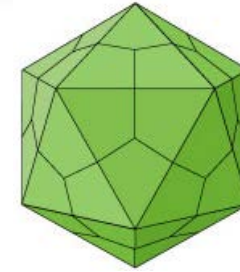
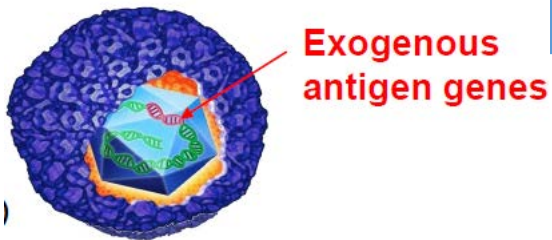
## Vaccine concepts



Whole virus and subunit preparations

Live attenuated virus

Vectorized, propagation-defective

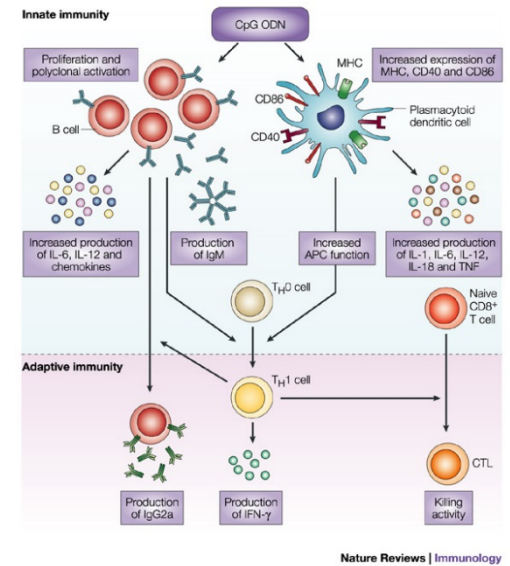


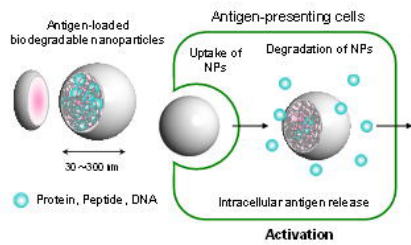
Immunology of long term protection

Link between innate and adaptive immune responses

Analyze adaptive CTL responses

B-cell responses involved in long term protection

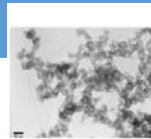




Optimization of delivery systems

Assays for long-lasting antiviral immunity

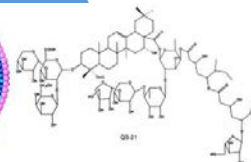
RNA seq / Array



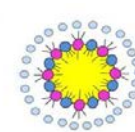
Aluminium



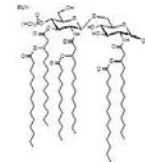
Liposomes



Saponins



Oil-in-water, water-in-oil emulsions



TLR agonists

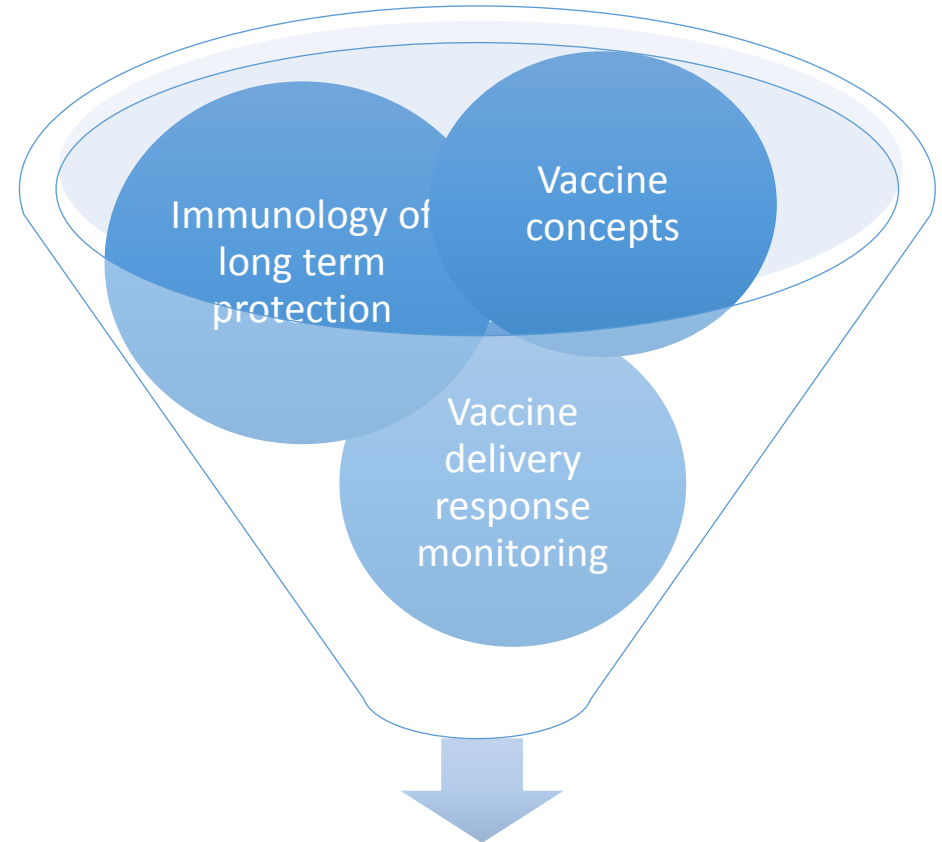
### **Efficacy**

### **Safety**

In target species  
Dissemination  
Reversion  
Latency

### **Ecotoxicity**

Target versus non-target species  
Host range.  
Establishment in the environment  
Potential for recombination



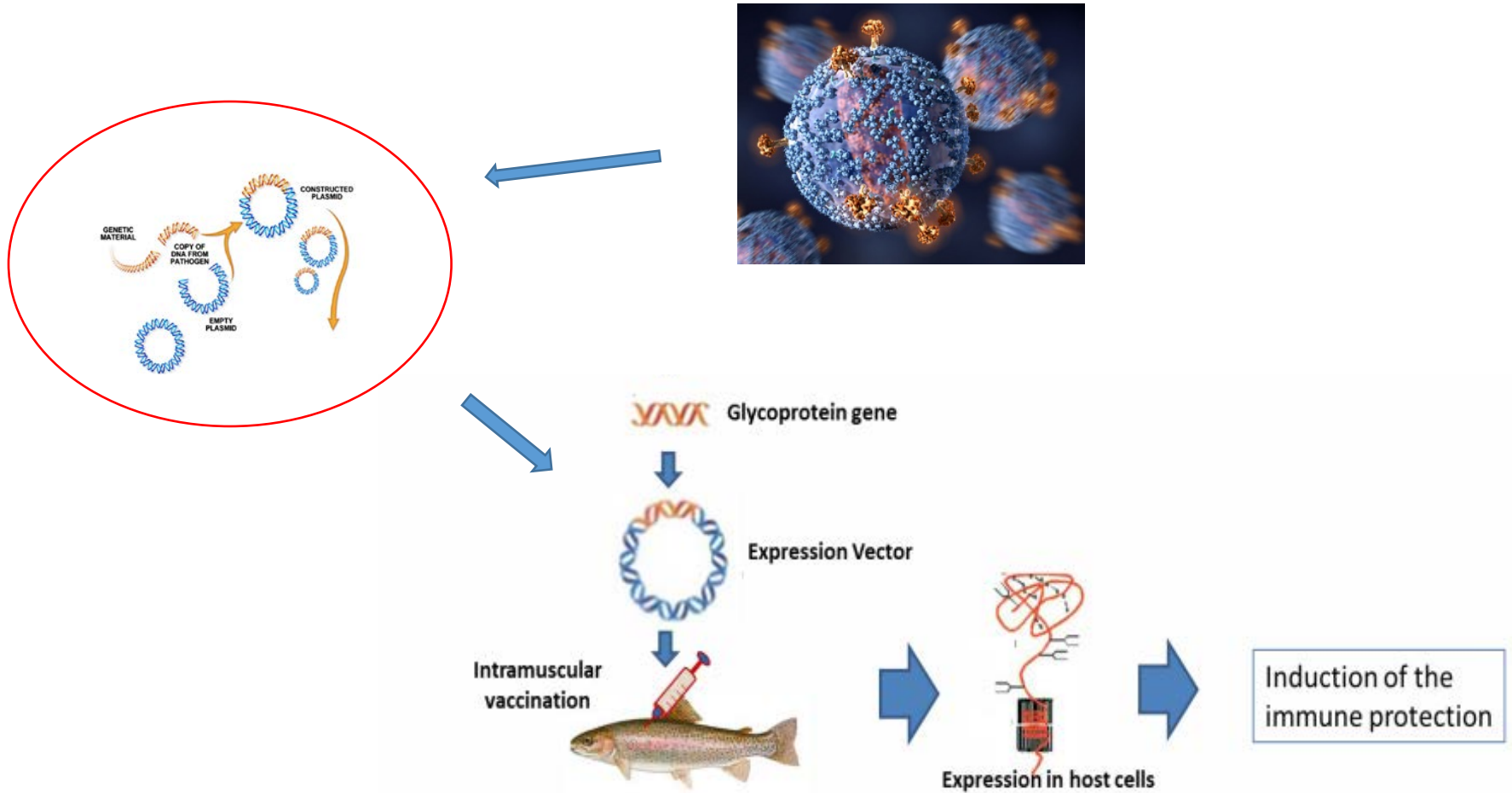
Improved prototypes for vaccines

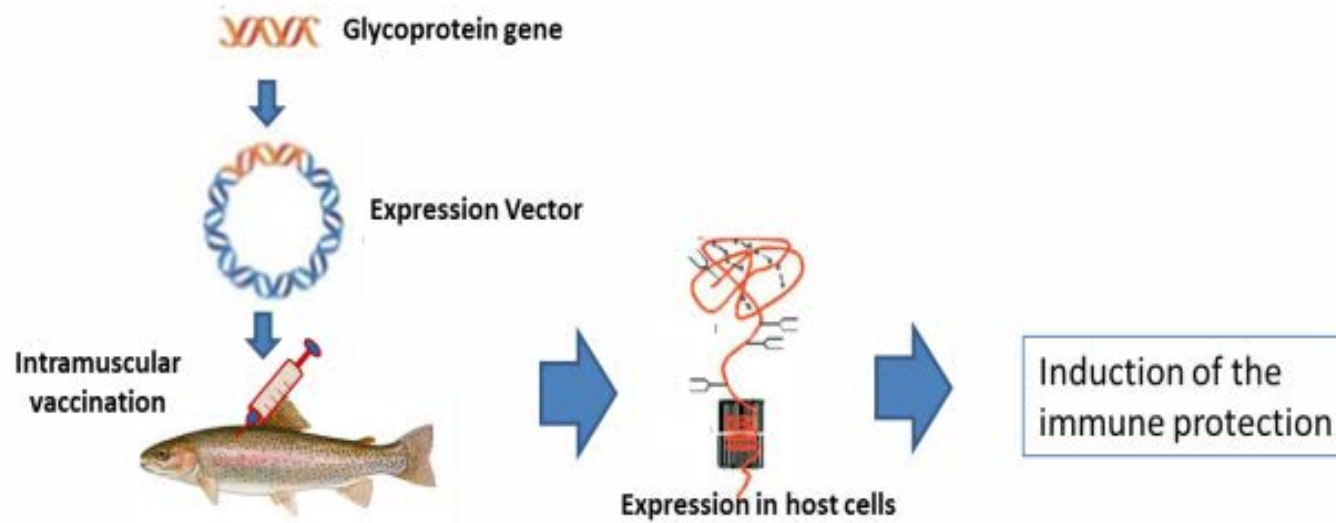


## ILA vaksine

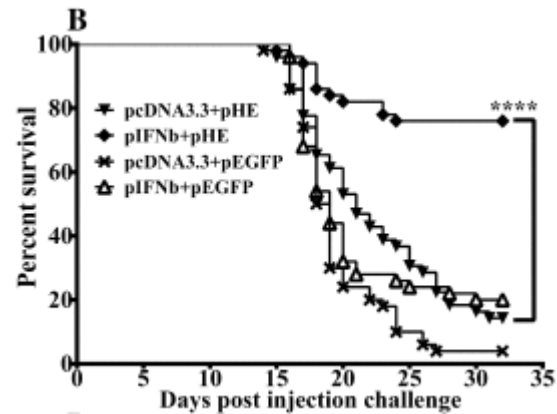
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- Chang CJ, Robertsen C, Sun B, Robertsen B. Protection of Atlantic salmon against virus infection by intramuscular injection of IFN $\alpha$  expression plasmid. *Vaccine.* 2014 Aug 6;32(36):4695-702. doi: 10.1016/j.vaccine.2014.05.059. PubMed PMID: 24996122.
- Wolf A, Hodneland K, Frost P, Hoeijmakers M, Rimstad E. Salmonid alphavirus-based replicon vaccine against infectious salmon anemia (ISA): impact of immunization route and interactions of the replicon vector. *Fish Shellfish Immunol.* 2014 Feb;36(2):383-92. doi: 10.1016/j.fsi.2013.12.018. PubMed PMID: 24374059.
- Wolf A, Hodneland K, Frost P, Braaen S, Rimstad E. A hemagglutinin-esterase-expressing salmonid alphavirus replicon protects Atlantic salmon (*Salmo salar*) against infectious salmon anemia (ISA). *Vaccine.* 2013 Jan 11;31(4):661-9. doi: 10.1016/j.vaccine.2012.11.045. PubMed PMID: 23200939



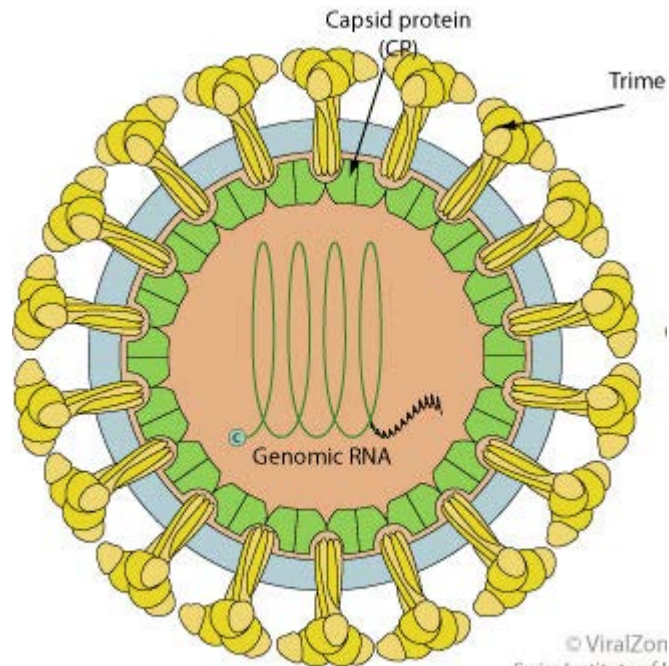
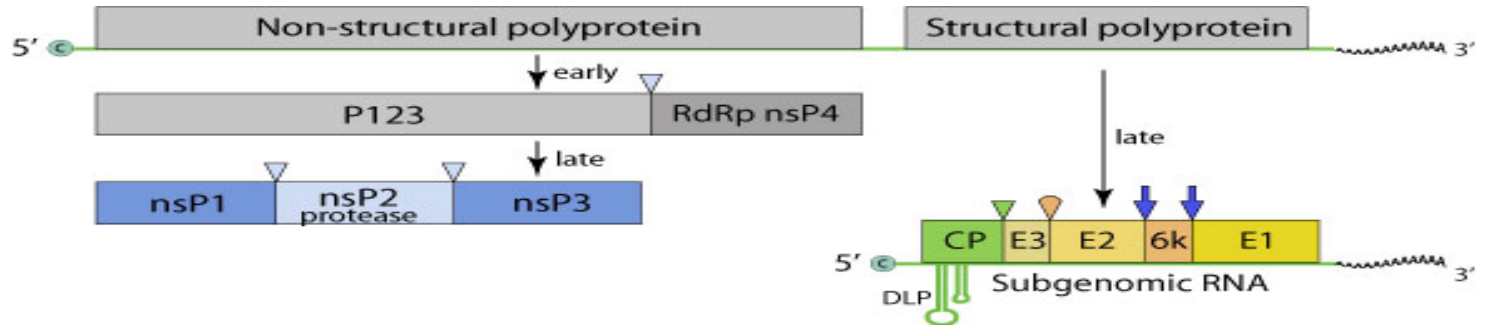


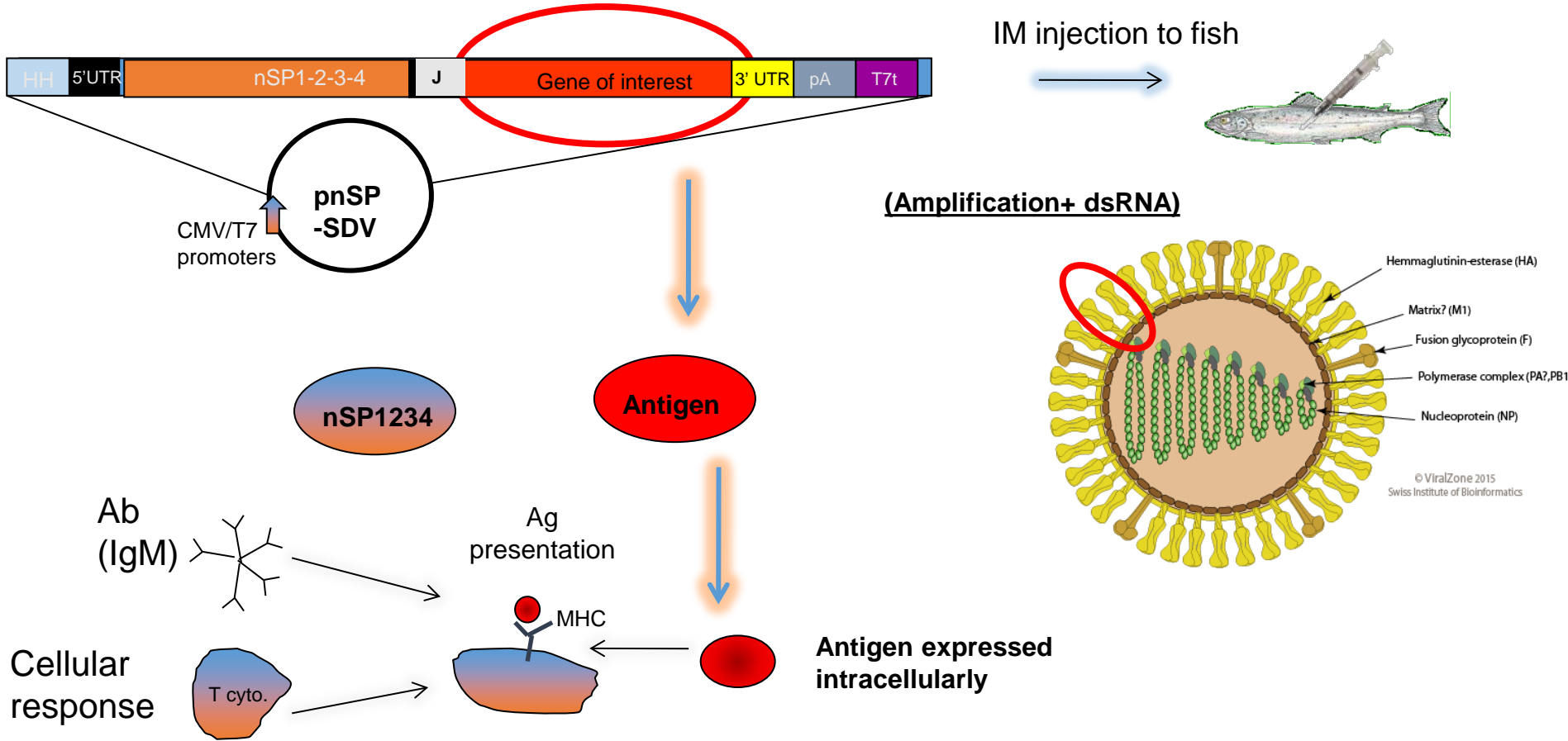


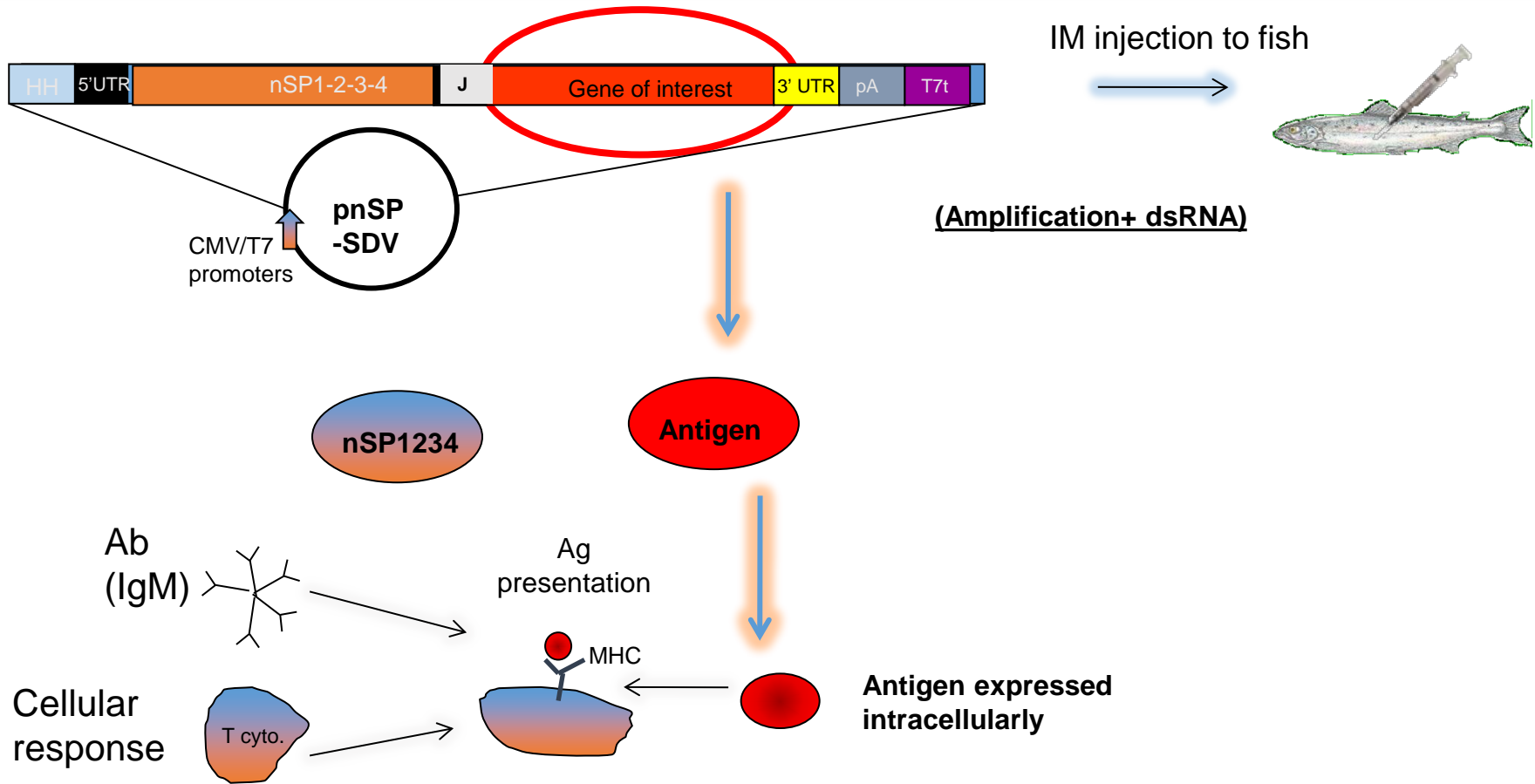
Chang et al 2014, Robertsen et al 2016

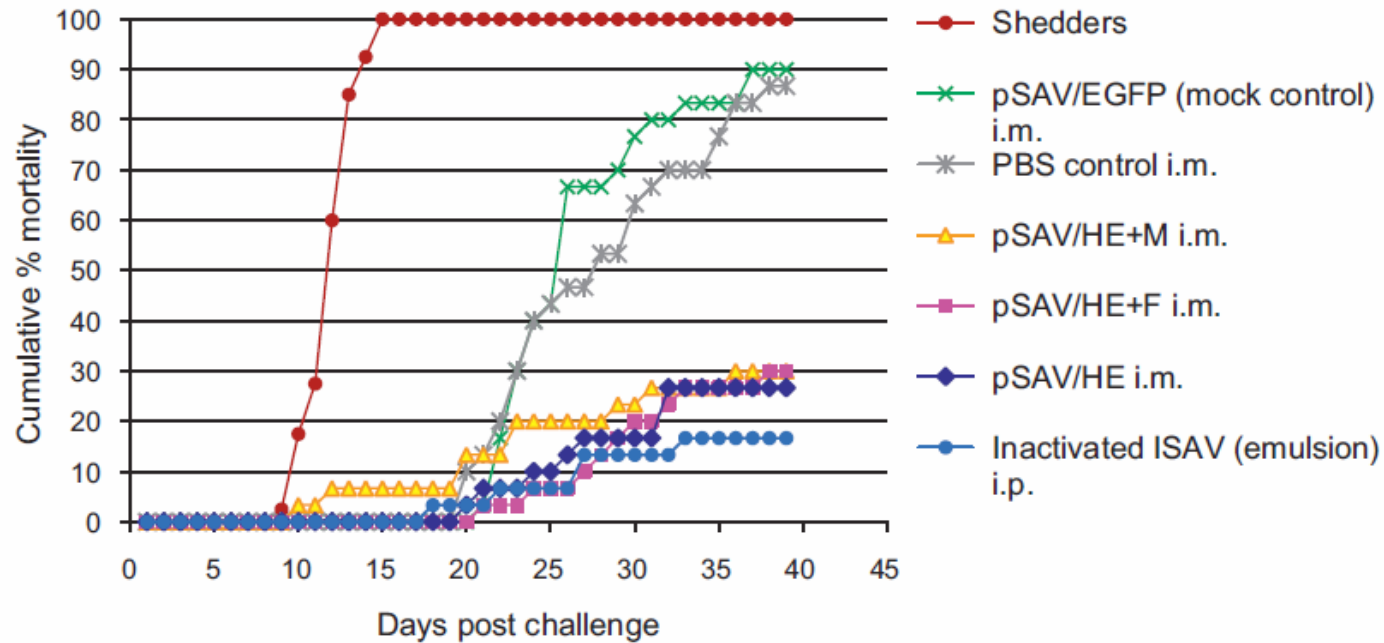


Pancreas disease virus is an Alphavirus



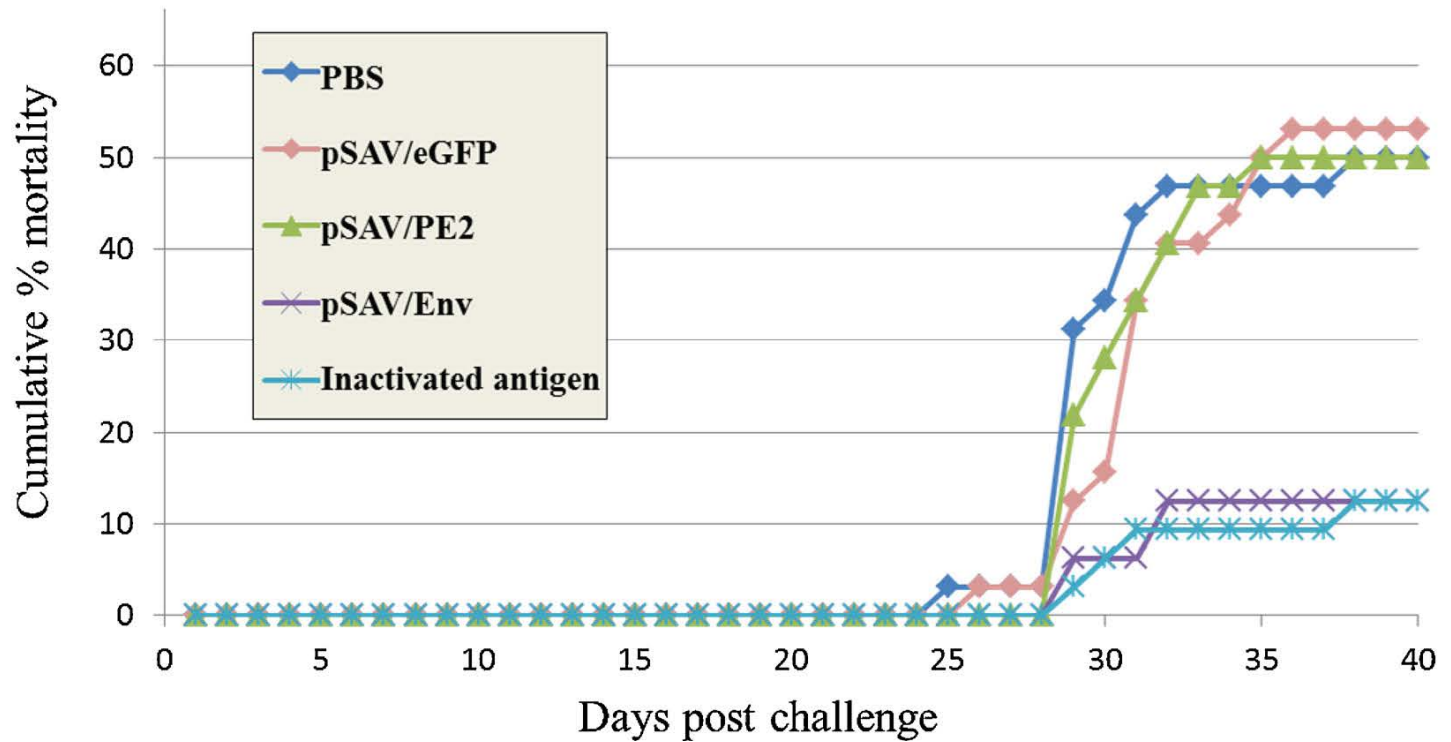






Infeksiøs lakseanemi - ILA

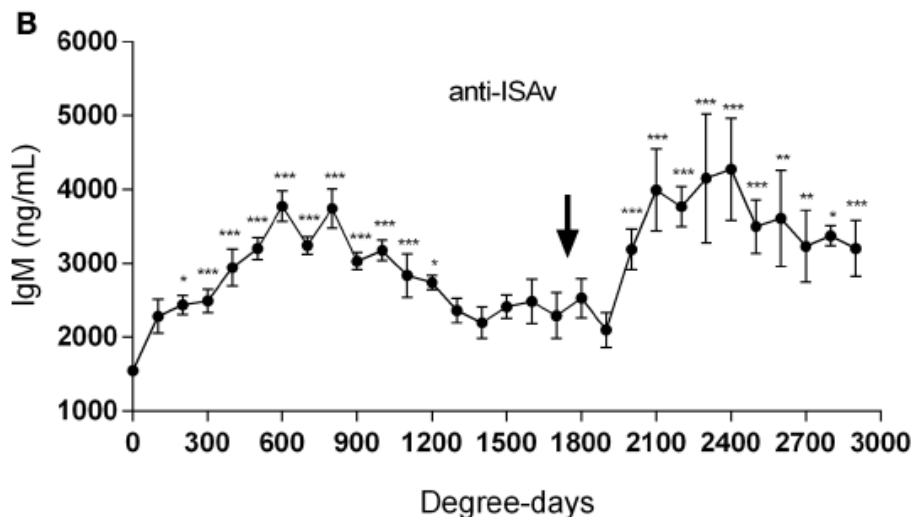
Wolf et al 2013, 2014



Pankreas sykdom - PD

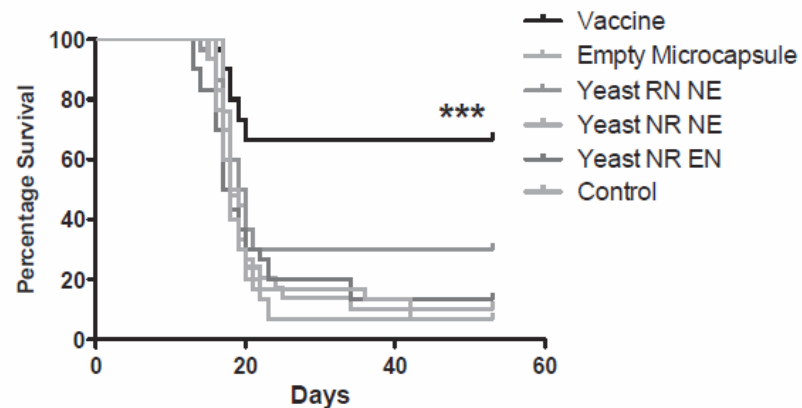
Hikke et al 2014

# Oral vaccines



Tobar et al 2015 –CentroVet (Chile)

Oral booster etter injeksjonsvaksiner gir økt mengde spesifikk IgM



Caruffo et al 2016, –CentroVet (Chile)

Oral vaksine alene gir en viss beskyttelse dersom den er pakket inn i spesielle mikrocapsuler.





# ISA as a model?



RESEARCH ARTICLE



## Characterization of a Novel Orthomyxo-like Virus Causing Mass Die-Offs of Tilapia

Eran Bacharach,<sup>a</sup> Nischay Mishra,<sup>b</sup> Thomas Briese,<sup>b</sup> Michael C. Zody,<sup>c</sup> Japhette Esther Kembou Tsofack,<sup>a</sup> Rachel Zamostiano,<sup>a</sup> Asaf Berkowitz,<sup>d</sup> James Ng,<sup>b</sup> Adam Nitido,<sup>b</sup> André Corvelo,<sup>c</sup> Nora C. Toussaint,<sup>c</sup> Sandra Cathrine Abel Nielsen,<sup>b\*</sup> Mady Hornig,<sup>b</sup> Jorge Del Pozo,<sup>e</sup> Toby Bloom,<sup>c</sup> Hugh Ferguson,<sup>f</sup> Avi Eldar,<sup>d</sup> W. Ian Lipkin<sup>b</sup>

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E.B. and N.M. contributed equally to this article.



- ISAV is a relative to Tilapia Lake virus.