

# FIRST ISOLATION OF A RHABDOVIRUS FROM PERCH *PERCA FLUVIATILIS* IN SWITZERLAND



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## Context

➔ *Perca fluviatilis* is a fish species of increasing interest for several European countries :

-full life cycle now established in recirculation systems

-high market prices and very good flesh quality

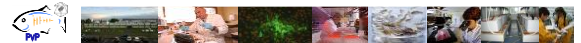


➔ Culture intensification and insufficient biosafety measures

Infectious diseases

High economical losses

Risk for the further development of this aquaculture



## Context

➔ **Perch rhabdovirus :**

- first isolation in France in 1980 from wild perch captured and acclimated to laboratory conditions (Dorson et al. 1984)

- Affected fish: loss of equilibrium, impaired swimming behavior, 30% of cumulative mortality

➔ Similar scenarios were reported later in other European countries (Denmark, Ireland, Sweden, Germany, Norway, ...)

➔ Occasional descriptions in the natural environment

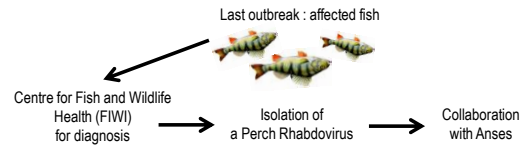
➔ Perch rhabdoviruses = **new genus *Perhabdovirus*** with the two other species *Anguillid rhabdovirus* and *Sea Trout Rhabdovirus (STRV)*



## Problematic



**2013**  
Significant mortalities in a commercial perch farm located in Switzerland  
2 to 3 weeks after stocking of imported fish



➔ **Description of the outbreak, finding the cause and characterization of the isolated agent**



## First investigations



**Clinical sign (19-20°C):**

- Aberrant swimming behavior : bouts of spiraling and swimming to the surface followed by sinking to the bottom and lethargy  
- Significant mortality rate (~30%)



**Parasitological investigation:**

Light to moderate infection of the skin and gills by *Ichthyobodo necator*



**Bacteriological analysis:**

Bacterial colonies in only one fish - all other fish were negative



**Histological observations:**

No particular tissue alterations



## Virological analysis



**Viral growth, exclusively on BF-2 cells**

Tank	Submission (fish size)	Aberrant swimming behavior	Tissue sampled	CPE
1	1 (6-7 cm)	yes	Pooled brain, heart, spleen, kidney	yes
8 days after sample 1	2 (6-20 cm)	yes	Brain	yes
	3 (6-20 cm)	no	Pooled heart, spleen, kidney	no
	3 (6-20 cm)	no	Brain	no
2	4 (6-20 cm)	no	Pooled heart, spleen, kidney	no
	4 (6-20 cm)	no	Brain	no

Each group consisted of 5 to 8 fish. All tanks belonged to the same recirculation cycle.

CPE only : from sample containing **brain material** from fish showing an **aberrant swimming behavior**

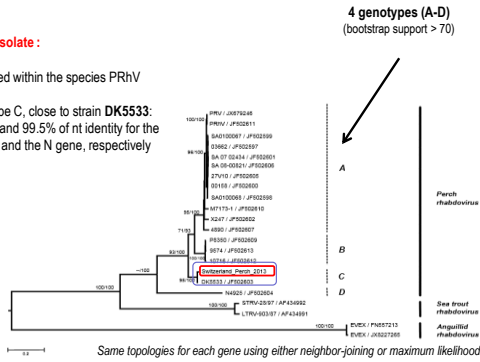
IF : NEG for antibodies against VHSV, IHNV, IPNV  
POS with the Danish anti-PRhV antibody DVFV-26

## Phylogenetic analysis : partial N gene – complete G gene

### Swiss isolate :

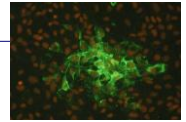
Clustered within the species PRhV

Genotype C, close to strain DK5533: 98.1 % and 99.5% of nt identity for the G gene and the N gene, respectively



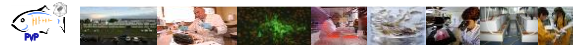
## Immunofluorescence profile

Swiss PRhV versus reference strains / Different antisera



Isolate * (genotype)	Origine - year	Host	Rabbit anti-		
			PRV (A)	DK5533 (C)	R6146 (E/STRV species) [FR - 2005]
PRV (A)	FR - 1980	Perch	+	+	0
9574.01 (B)	FR - 2009	Perch	+	+	0
DK5533 (C)	DK - 1989	Pike	0	+	0
N4925 (D)	FR - 2003	Perch	+	+	0
Swiss isolate (C)	CH - 2013	Perch	+	+	0

\* Inoculation of CHSE<sub>264</sub> and RTG<sub>2</sub> cells



## Aa differences for the glycoprotein among the two serogroups identified

99.2, 95.6 and 95.8% of aa identity for the G gene with strains DK5533, PRV and 9574.01

Position	Amino-acid				13 ≠ between the strains tested :
	PRV 9574.01 (I) <sup>a</sup>	DK5533 (II)	Swiss isolate (I)	N4925 <sup>a</sup> (I)	
33	T	A	A	T	12 common positions DK5533/Swiss
37	D	S	S	D	
58	E	K	K	E	4 common positions DK5533/Swiss/N4925
147	S	P	S	S	
248	S	A	A	S	1 common position among all strains of "serogroup I" : serine in position 147 (ectodomain) Substituted by a proline in DK5533
270	K	E	E	K	
277	E	G	G	E	
371	V	I	I	V	
375	K	R	R	K	
431	I	V	V	I	
432	P	Q	Q	P	
486	I	V	V	I	
490	V	I	I	V	

<sup>a</sup> From amino-acid sequences published by Talbi et al. (2011) and Stone et al. (2013). <sup>b</sup> Serogroup



## Conclusions

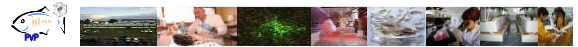
A **Perch rhabdovirus** was diagnosed for the **first time** from perch in **Switzerland**  
- aberrant spiraling swimming behavior interrupted by phases of lethargy  
- no macroscopically nor histologically organ alterations  
- virus isolated exclusively from fish showing clinical signs / sample containing brain

**Origin of the virus : still unclear**

imported fish (tested negative for PRhV but without including brain before delivery)?  
latent infection in the farm ?

**High level of identity between Swiss isolate and strain DK5533 :**

- movement of infected fish between the two places ?  
- common origin for these two viruses, likely through an introduction of infected fish in both places from a common source before 1989 ?



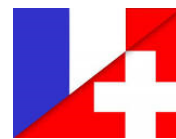
## Conclusions

**Proline in position 147 of the G protein** in strain DK5533 :  
only one aa that differs with the Swiss isolate and all the other strains of the "serogroup I"

**Key role** in serological discrimination of PRhV isolates ?

**Future :**

clarify serological relationships with the PRhV species  
develop a serological test  
investigate the preferential tropism for the CNS



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