



Risks of Infectious Hematopoietic Necrosis Virus (IHNV) dispersion associated with Atlantic Salmon Net Pen Aquaculture

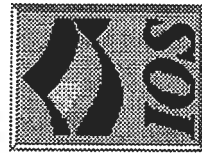
Kyle Garver¹, Amelia Grant¹, Jon Richard¹, Dario Stucchi² and
Mike Foreman²

¹*Pacific Biological Station, Nanaimo BC*

²*Institute of Ocean Sciences, Sidney BC*



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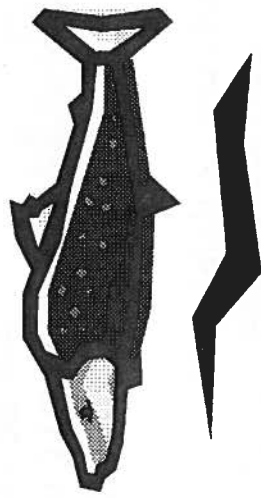
Aquaculture and Disease

- Aquaculture within sea-cages leads to possible disease risks from the marine environment due to the generality that fish sharing water are likely to share diseases.
- Need to understand endemic pathogens
 - Infectious hematopoietic necrosis virus (IHNV)

Infectious Hematopoietic Necrosis Virus (IHNV)



- Infects a variety of salmon and trout species throughout the Pacific Northwest.
- In British Columbia the first detection of IHNV was in Rainbow Trout and Sockeye salmon over 40 year ago (Amend et al. 1969).
- Since initial detection, IHNV predominately occurred in sockeye salmon.



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History of IHNV in Atlantic Salmon in BC

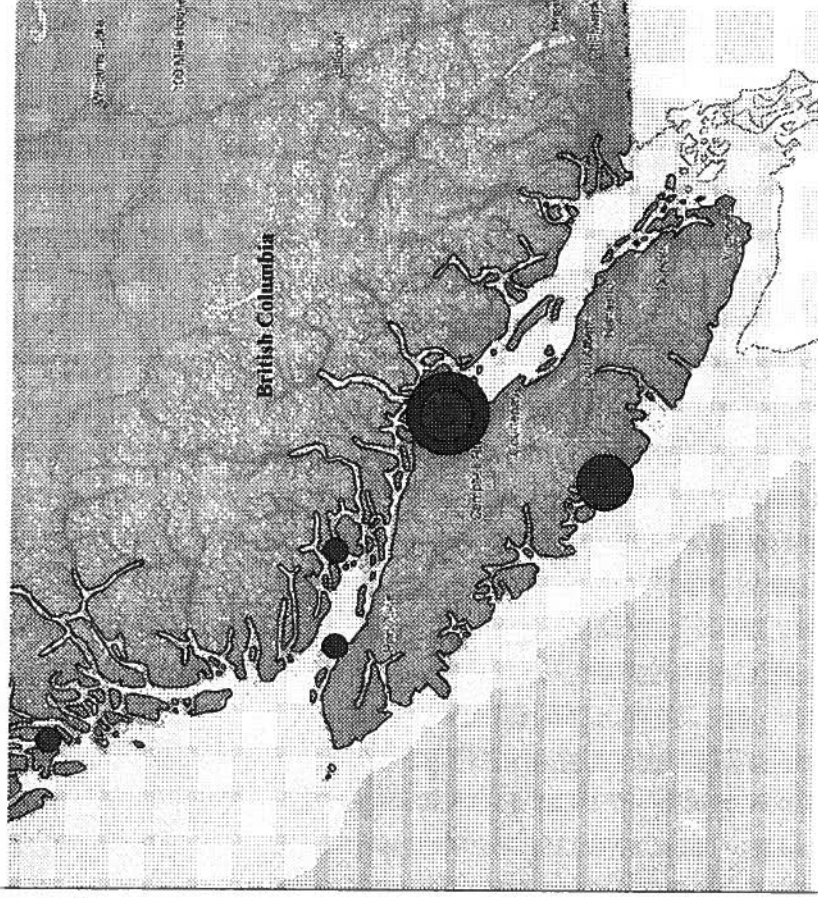
1992 : First occurrence of IHNV in farmed Atlantic salmon in BC

- From 1992-1997 a total of 14 netpen sites near Campbell River were affected all within 22 km radius

2001: Second outbreak occurred in same area

- 2001-03 Spread north to 3 other areas eventually involving 26 sites

2002: Third outbreak occurred on the west coast of Vancouver Island and eventually affected 10 sites



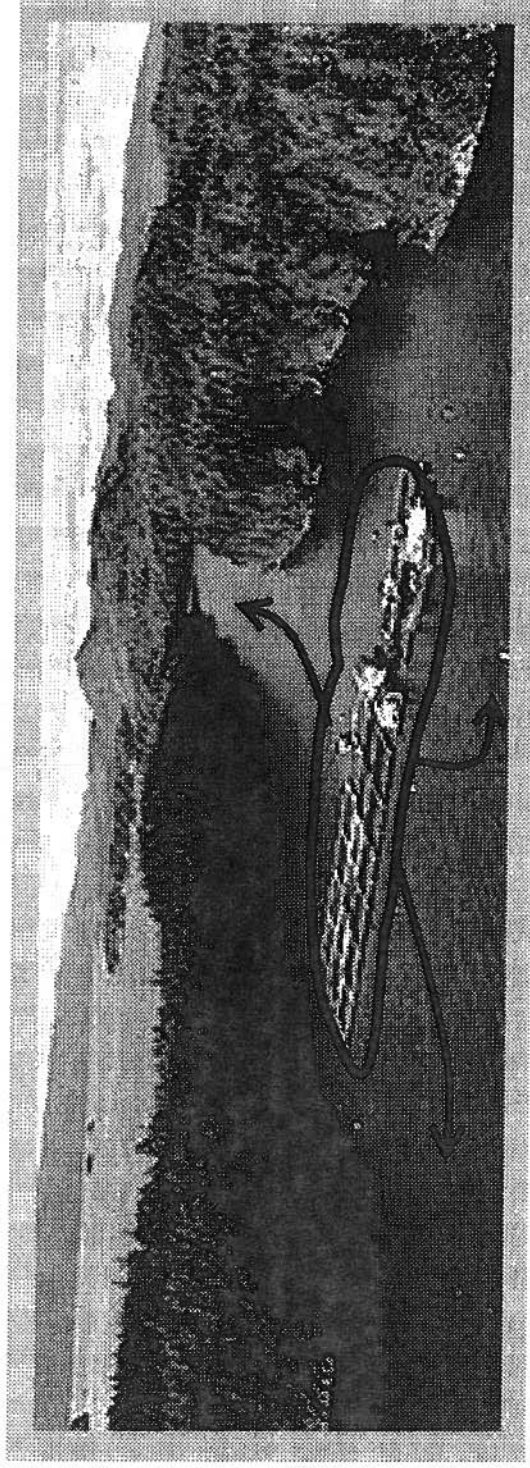
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What was learned?

Transmission = rapidly spread

Farms infected with IHN during an epidemic had an identical virus type indicating farm to farm spread.

- Anthropogenic
- Waterborne

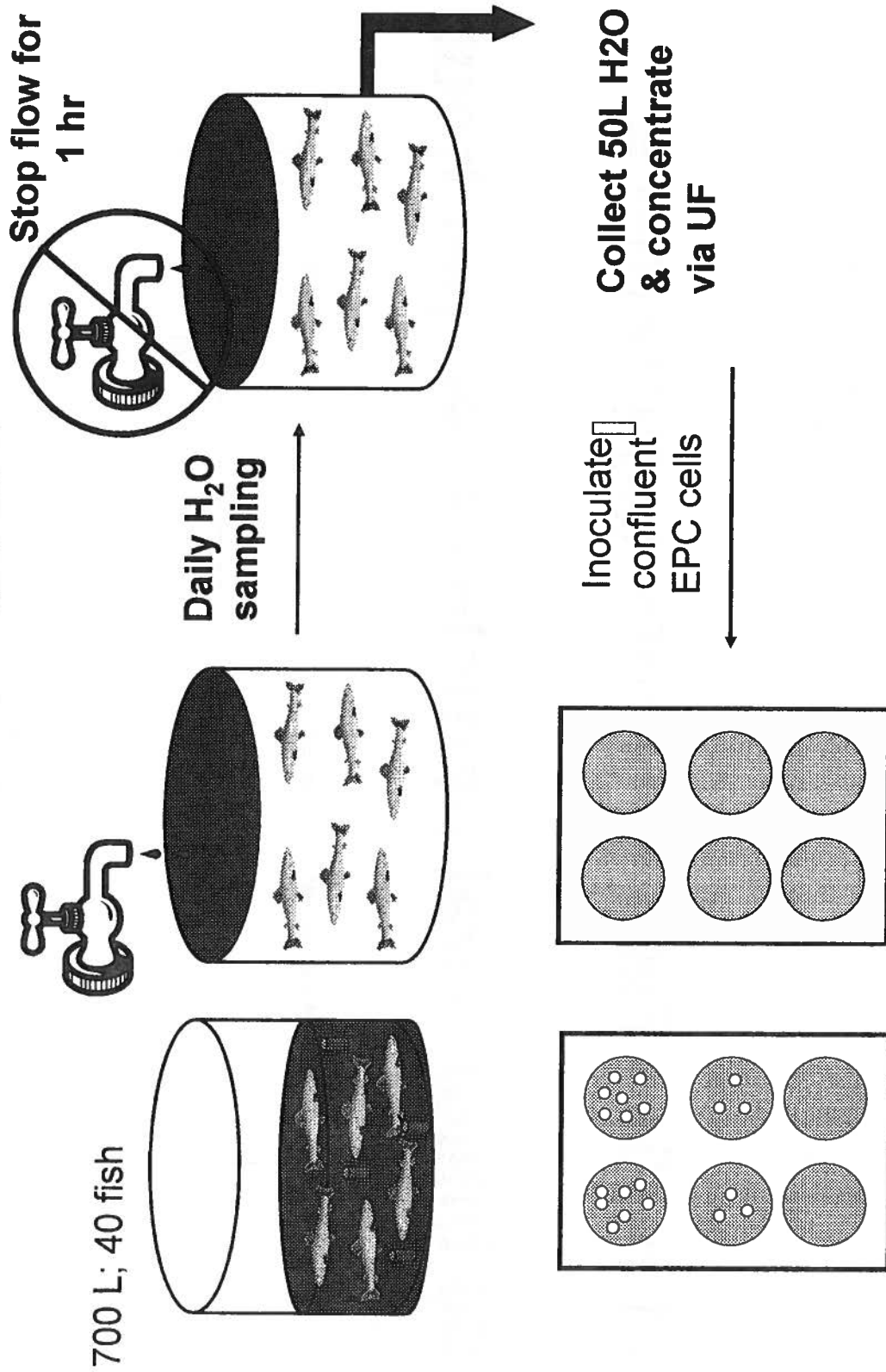


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Risk of virus dispersal from farms?

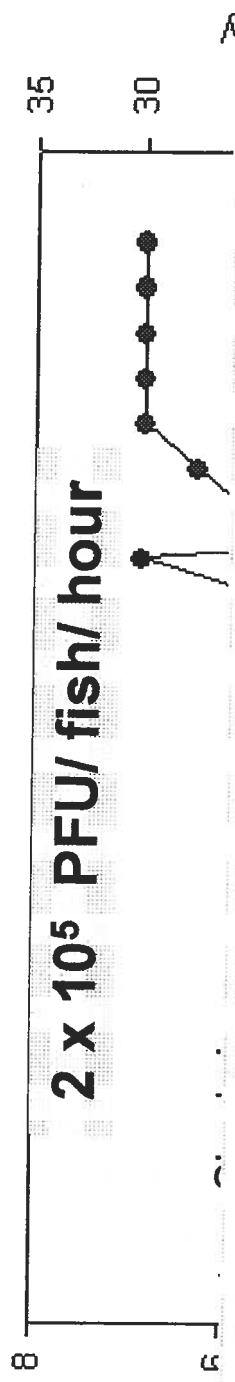
1. How much virus is produced from an infected farm? (Viral shedding rates of Atlantic salmon)
2. What is the minimum infectious dose of IHNV in Atlantic salmon?
3. How long can the virus last outside of its host? (Virus stability in seawater)

IHNV shedding set-up



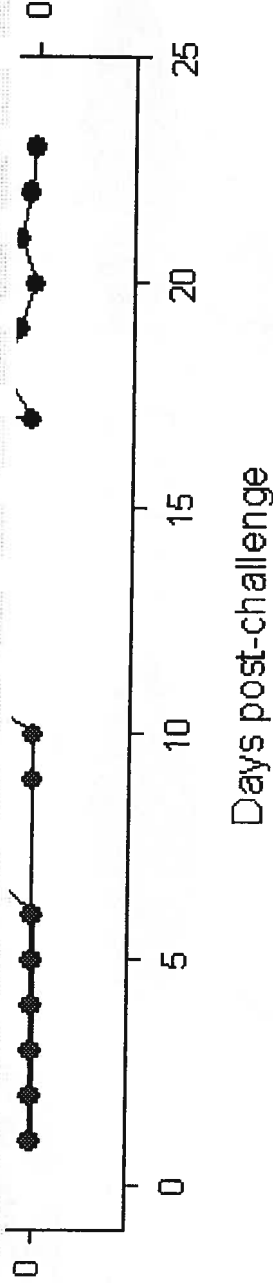
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IHNV shedding in Atlantic salmon



$$(1 \text{ million fish})(30\% \text{ infected})(2 \times 10^5) =$$

60 billion viral particles shed per hour



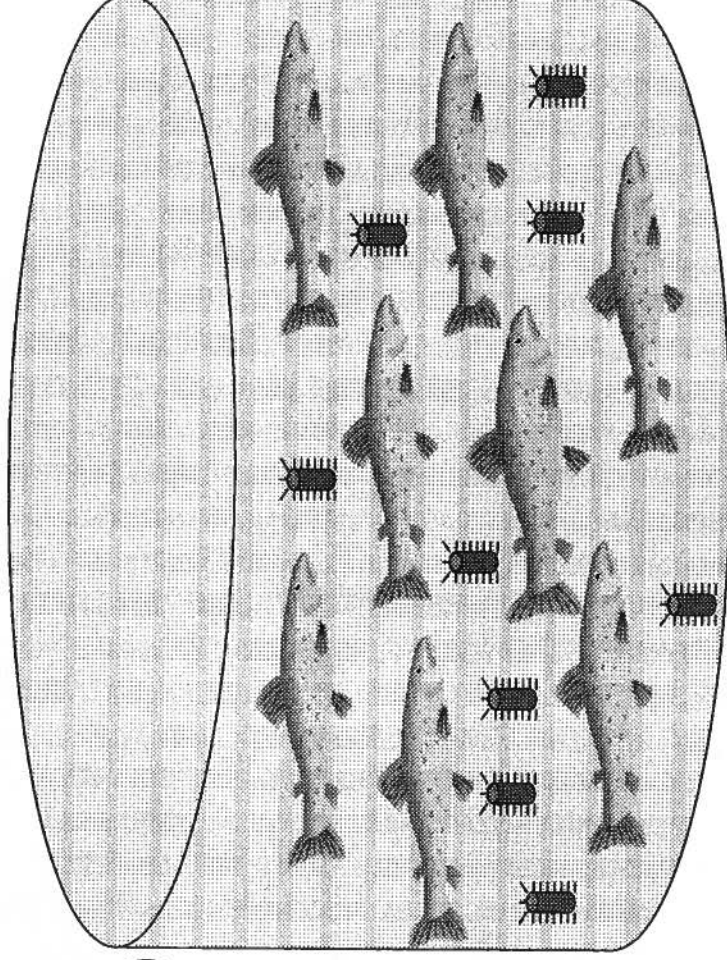
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Minimum Infectious Dose (MID)

- Waterborne exposure of Atlantic Salmon to IHNV
 - 1 hour static immersion challenge
 - IHNV strain isolated from Atlantic Salmon
 - 10 degrees Celsius

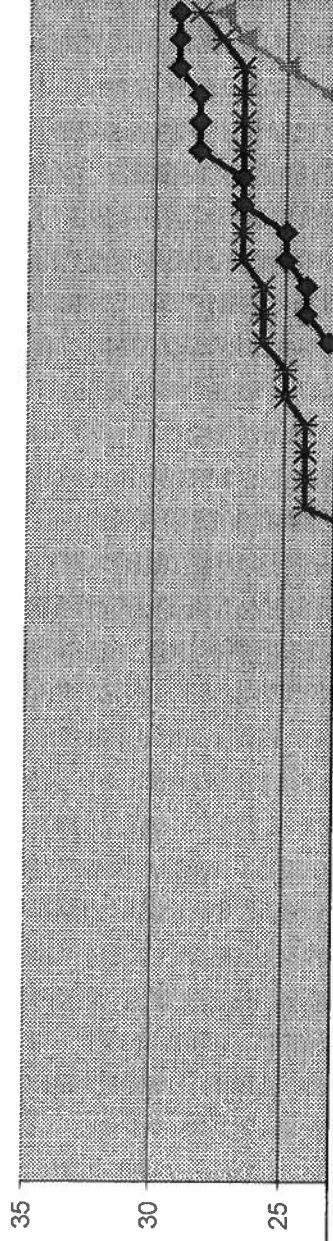
- Challenge dose (PFU/ML)
 - 10^4 , 10^3 , 10^2 , 10^1

- Monitor for mortality and assay for virus

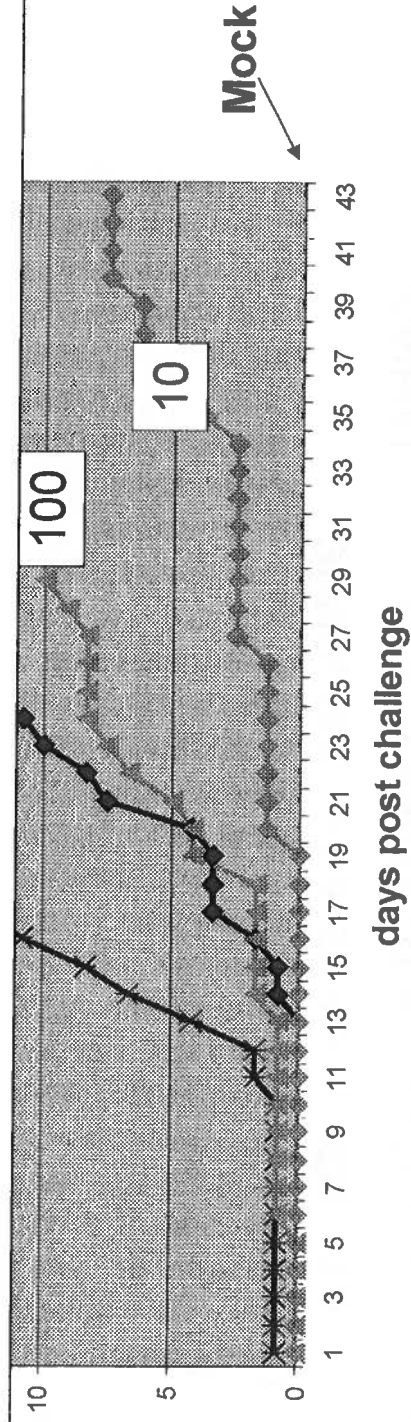


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Minimum infectious Dose



Minimum infectious dose can be as low as 10 PFU/ml



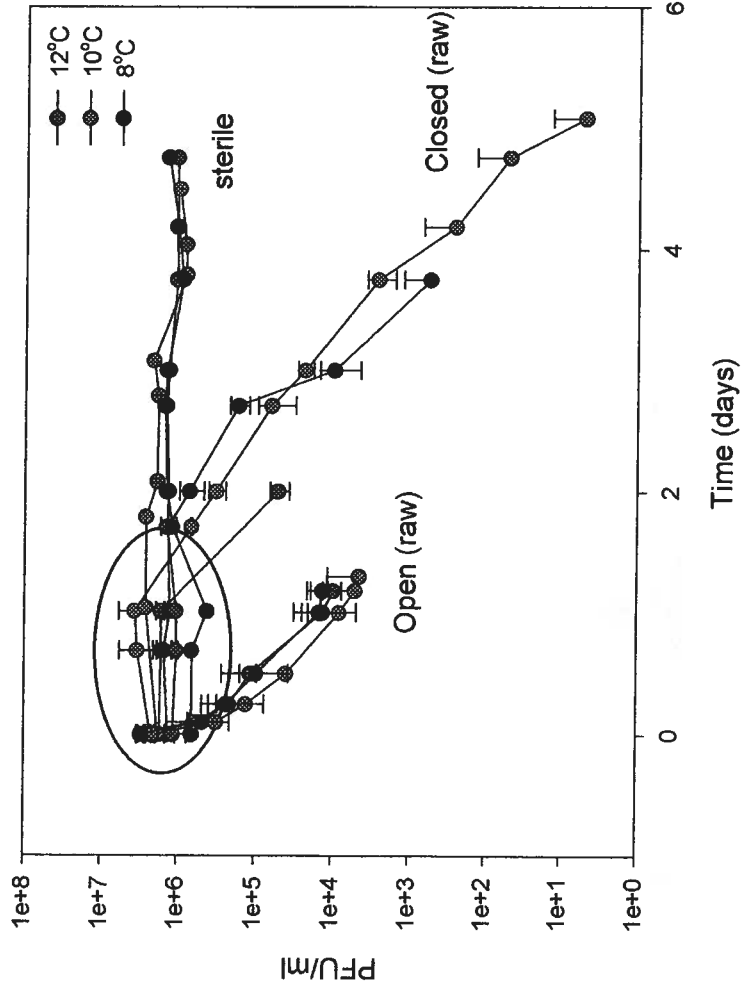
Virus stability in seawater

- Challenge: simulating natural conditions in the laboratory



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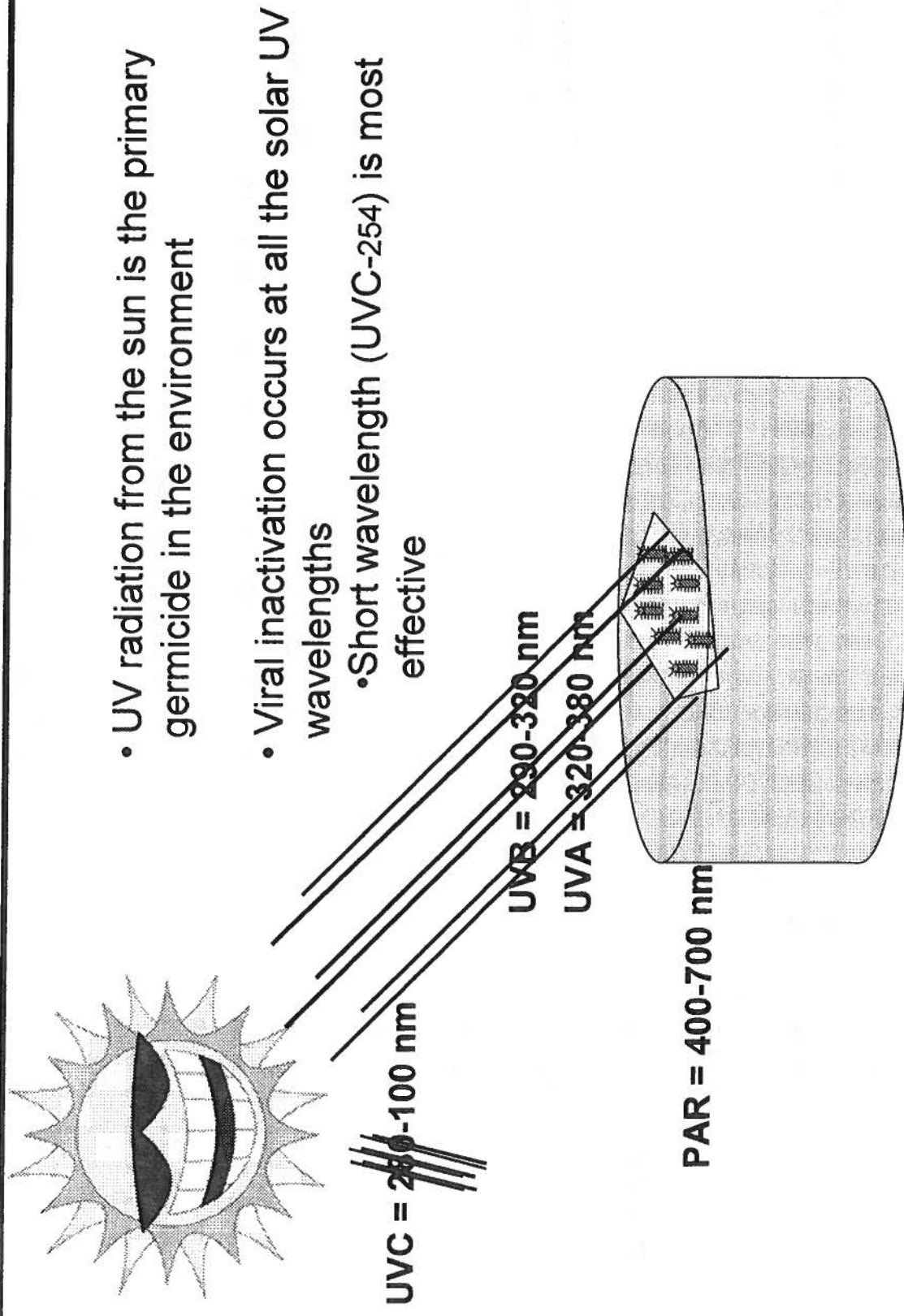
IHNV decay



Virus decay is highly dependent upon microbial content in the water

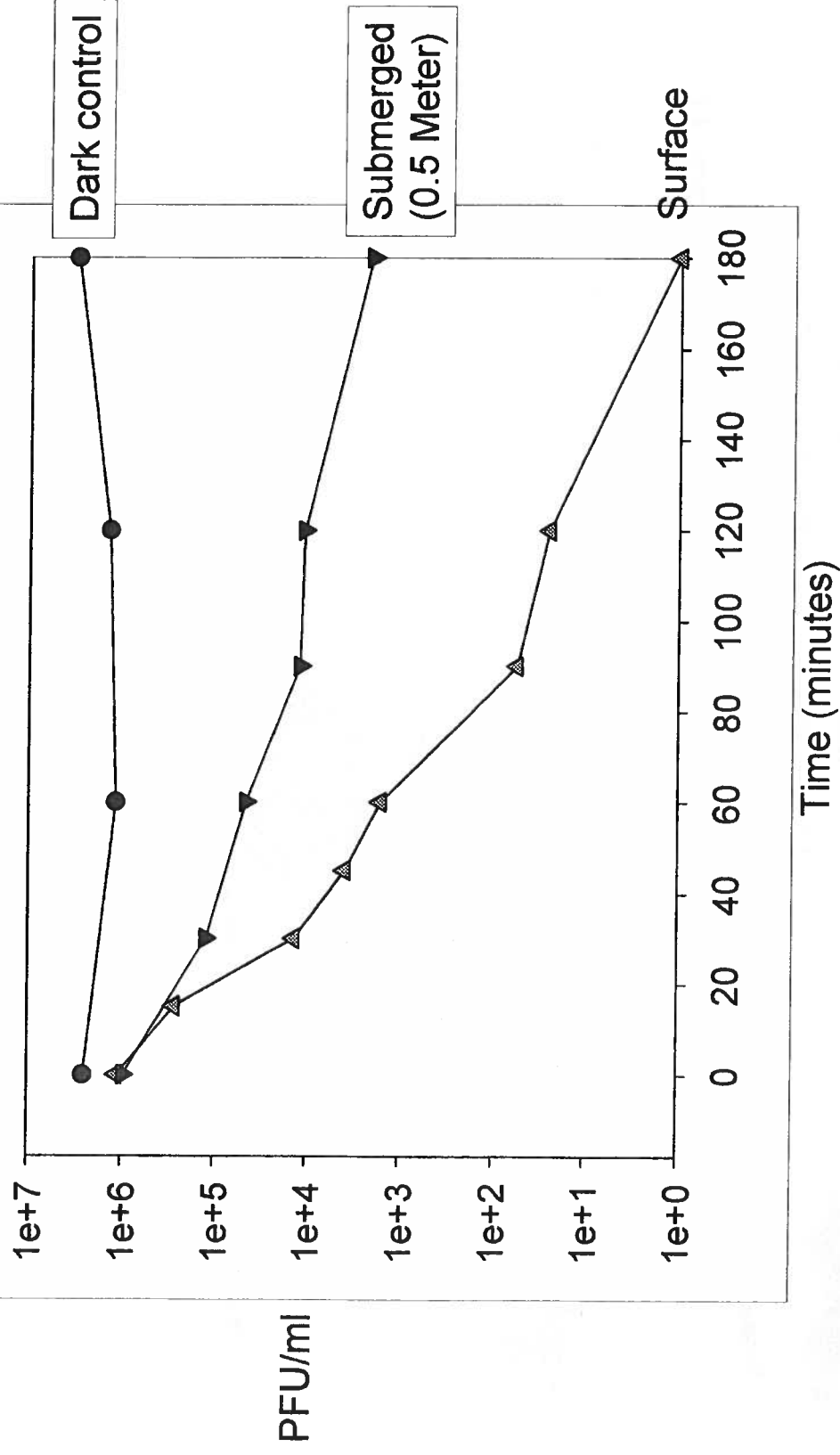
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Virus inactivation by sunlight



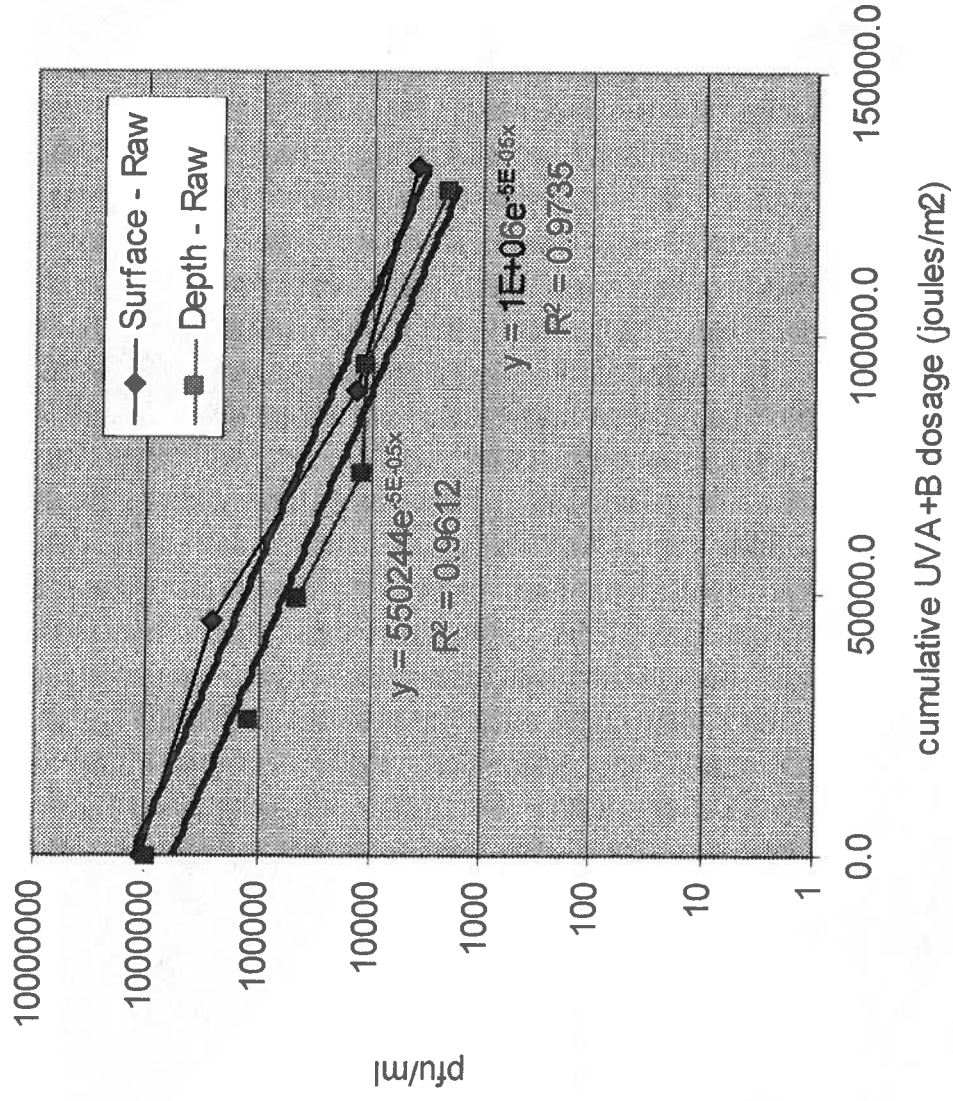
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IHAVN decay rate due to sunlight exposure



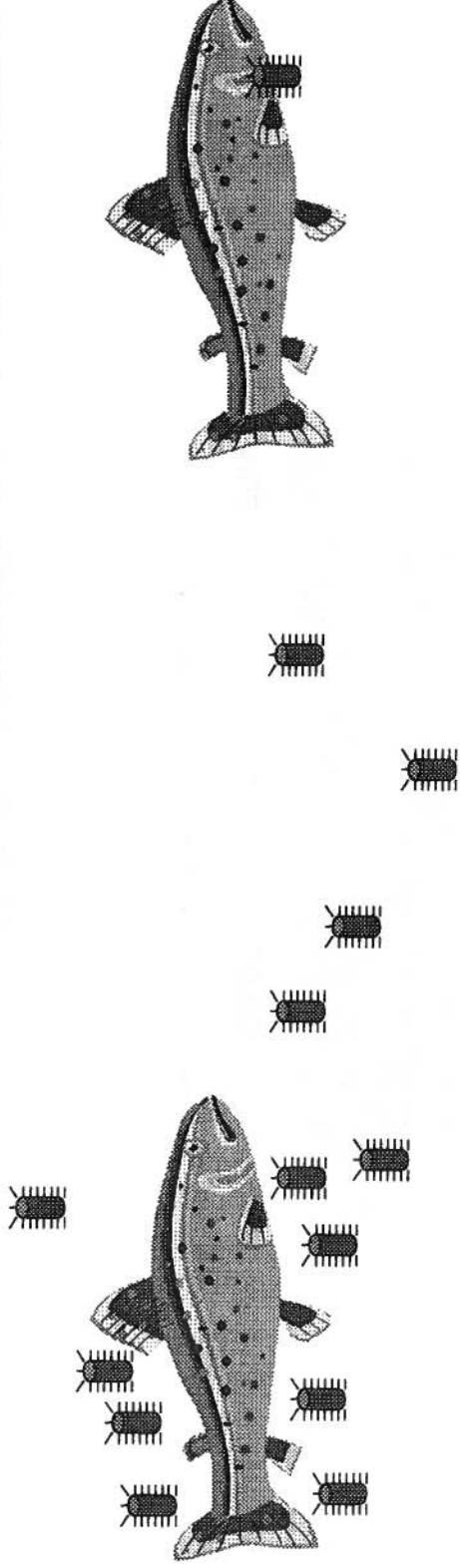
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IHNV decay rates – Sunlight exposed



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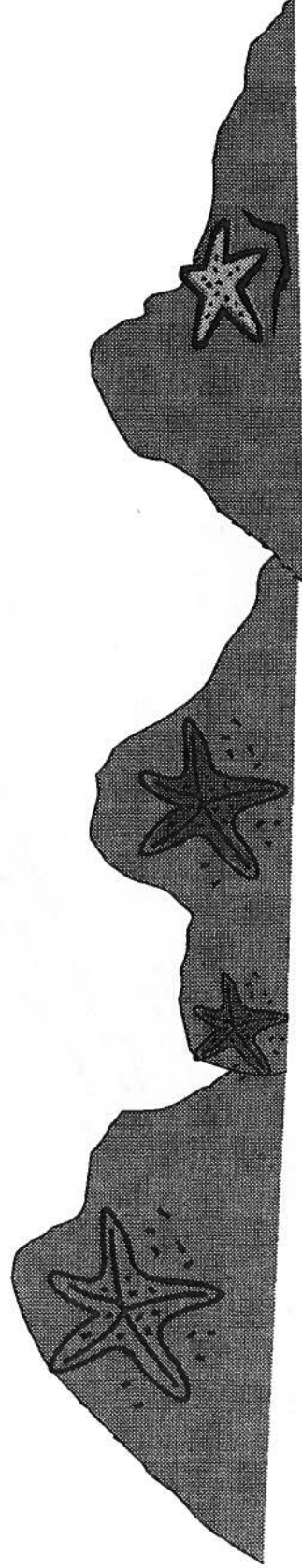
Summary



1) Large number of viruses are shed

2) Viruses decay rapidly in saltwater environments

3) Low doses of virus are infectious



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Water circulation???



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