

ODFW Fish Virology: Investigations into Oral Tumors of Grande Ronde Spring Chinook



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Oral Tumors in Grande Ronde Spring Chinook

- 86% of the Grand Ronde Captive Cohort 2000 held at Bonneville and Manchester are affected
- This disorder is apparent in four rivers within the Grande Ronde and Imnaha subbasins
- Wild, Conventional and Captive adults are affected across multiple year classes



Holy Crap! Did you see THAT???
We better call HOMELAND SECURITY!!!
...Uh...can I borrow your cell phone?

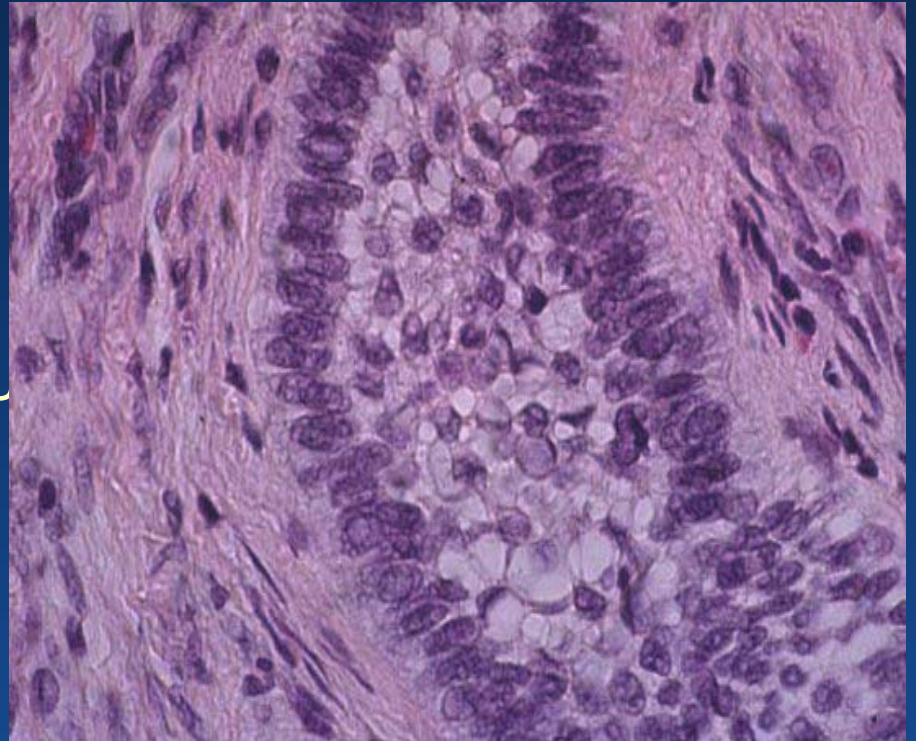
Histology

- Tumor Tissue
- Internal Organs

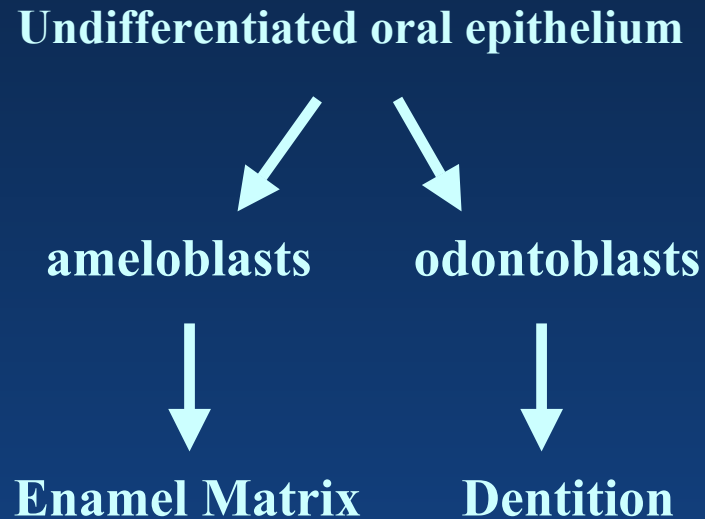
Tumor and Internal Organ Tissues
Examined by Dr. Jerry Heidel, OSU
Dept. Veterinary Science

Tumor Tissues Examined by Dr.
Charlie Smith, Bozeman Fish
Technology Center USFW

Tumor Tissues Examined by Dr.
Jeffrey Wolf, Registry of Tumors
In Lower Animals



Ameloblastoma



Ameloblastoma is a rare disorder of the jaw involving abnormal tissue growth. The resulting tumors or cysts are usually not malignant (benign) but the tissue growth may be aggressive in the involved area. On occasion, tissue near the jaws, such as around the sinuses and eye sockets, may become involved as well. The tissues involved are most often those that give rise to the teeth so that ameloblastoma may cause facial distortion. Malignancy is uncommon as are metastases, but they do occur.



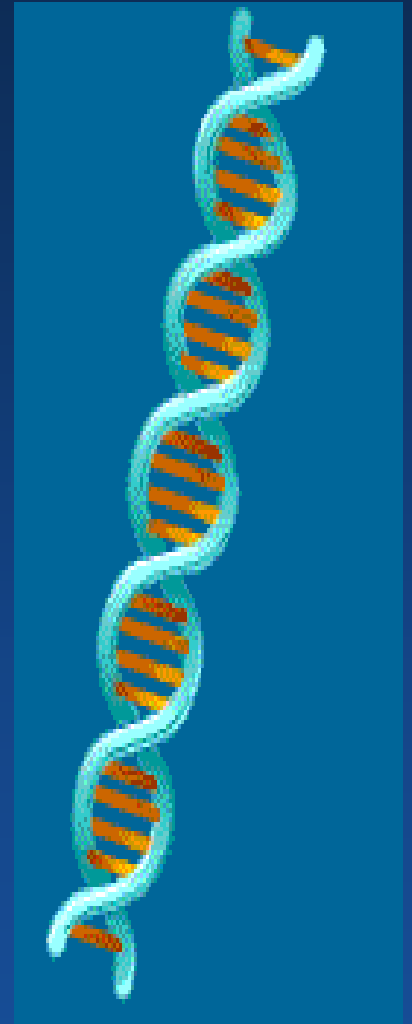
Neoplastic growth may be induced by many types of initiators

- Genetic Predisposition
- Radiation
- Toxic Substances
- Repeated Irritation to Tissue
- Viral Etiology



Oncogenesis

- Genes that stimulate cell growth are modified resulting in hyperactive cellular growth
- Genes that inhibit cell growth are disabled or switched off



Genetics

Are These Fish
Related ?



Genetics

Genetic analysis was conducted by Paul Moran, NOAA fisheries

- Calculated a shared allele metric (Bowcock et. al 1994) for affected and unaffected fish (N = 192 and 36 respectively)
- Estimates for both groups were exactly the same: (43% average similarity among individuals)

Genetics

Results:

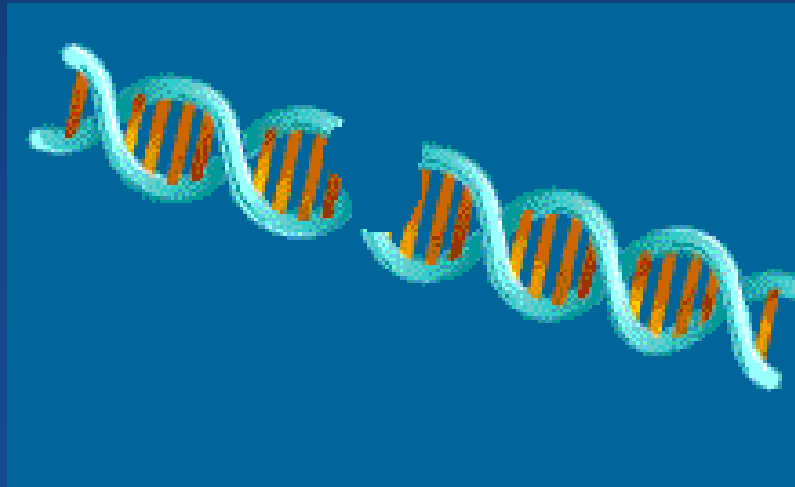
Fish affected with tumors are no more closely related to each other than the unaffected fish

And..

These fish are no more related to each other than any typical chinook population

Translation: There is likely NO genetic component causing these tumors

Genetic predisposition, radiation, toxic substances, and repeated tissue irritation damage cellular growth function



Viral pathogens insert their own copy of growth regulation genes into the host DNA or alter the expression of the host's copy of these genes

QuickTime™ and a
GIF decompressor
are needed to see this picture.

(Double click on picture)

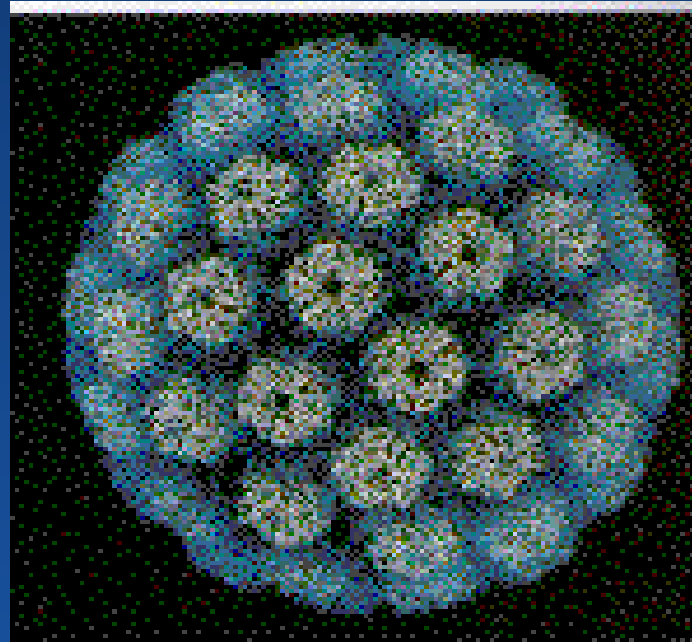
Oncogenic Viruses

DNA Viruses

- Papillomavirus
- Polyomavirus
- Adenovirus
- Herpesvirus
- Cytomeglovirus
- Hepadnavirus
- Iridovirus

RNA Viruses

- Retrovirus





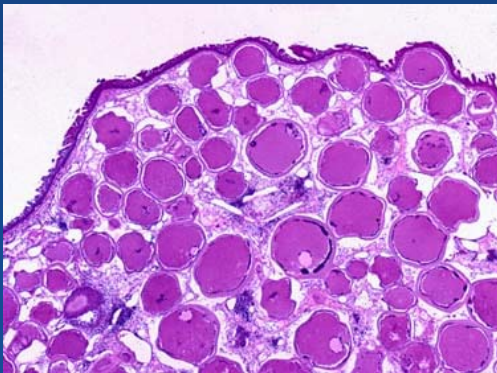
Oncorhynchus
Masou
Virus

- Caused by Herpesvirus Type 2
- Mortality in young fish
- Some survivors develop epithelial tumors
- Masou, kokanee, chum, coho, rainbow
- Found only in Japan

Lymphocystis

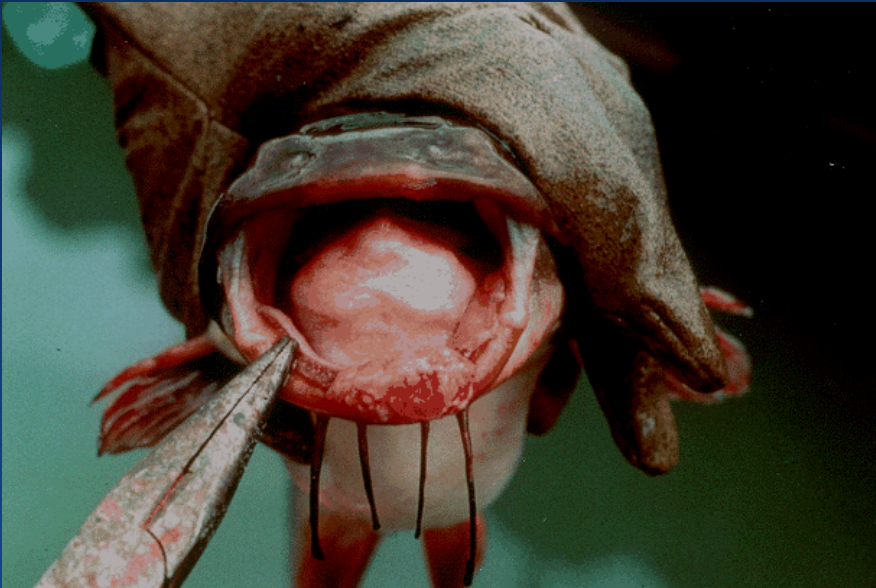


- Caused by Iridovirus
- Worldwide
- Marine and Freshwater
- Walleye, Flounder, Bass



Fibropapillomas

- Wart like
- Causes Unknown



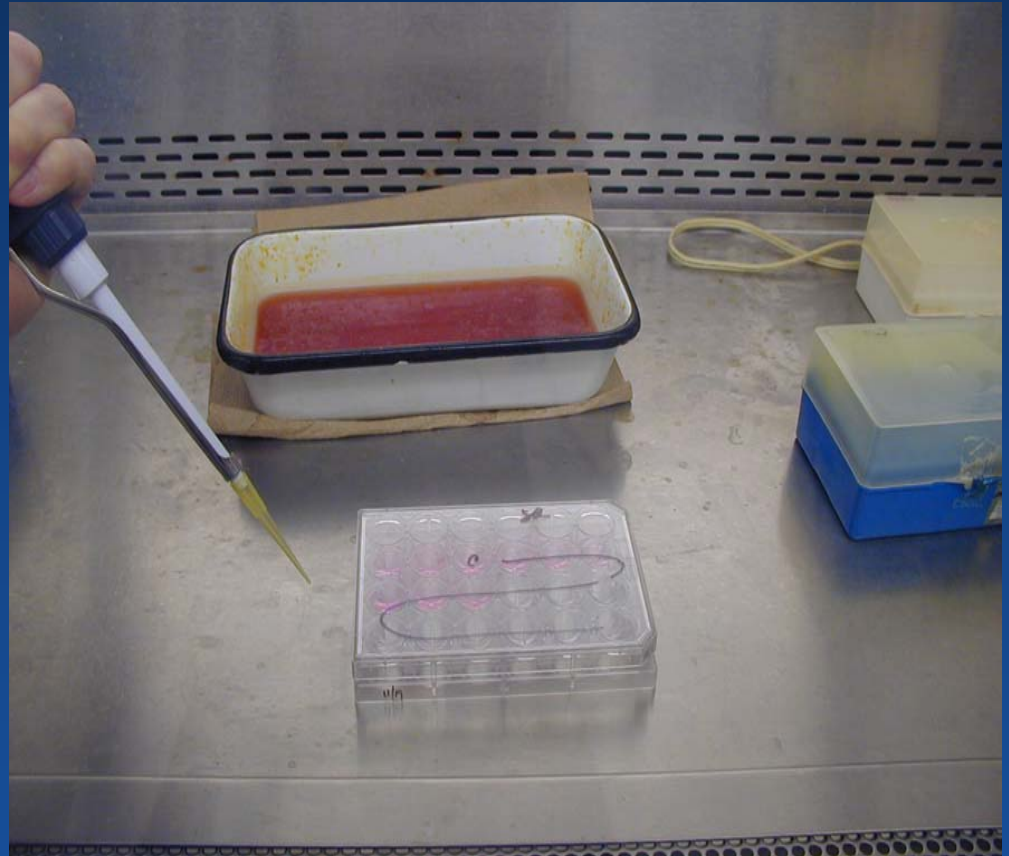
The Search for a Pathogen...

- Tissue Culture
- Primary Cell Culture
- Electron Microscopy
- Histology
- PCR
- Live Fish Experiments



Tissue Culture

- Tumor Tissue
- Internal Organs
 - EPC
 - CHSE -214
 - RTG2
 - BF2
 - FHM

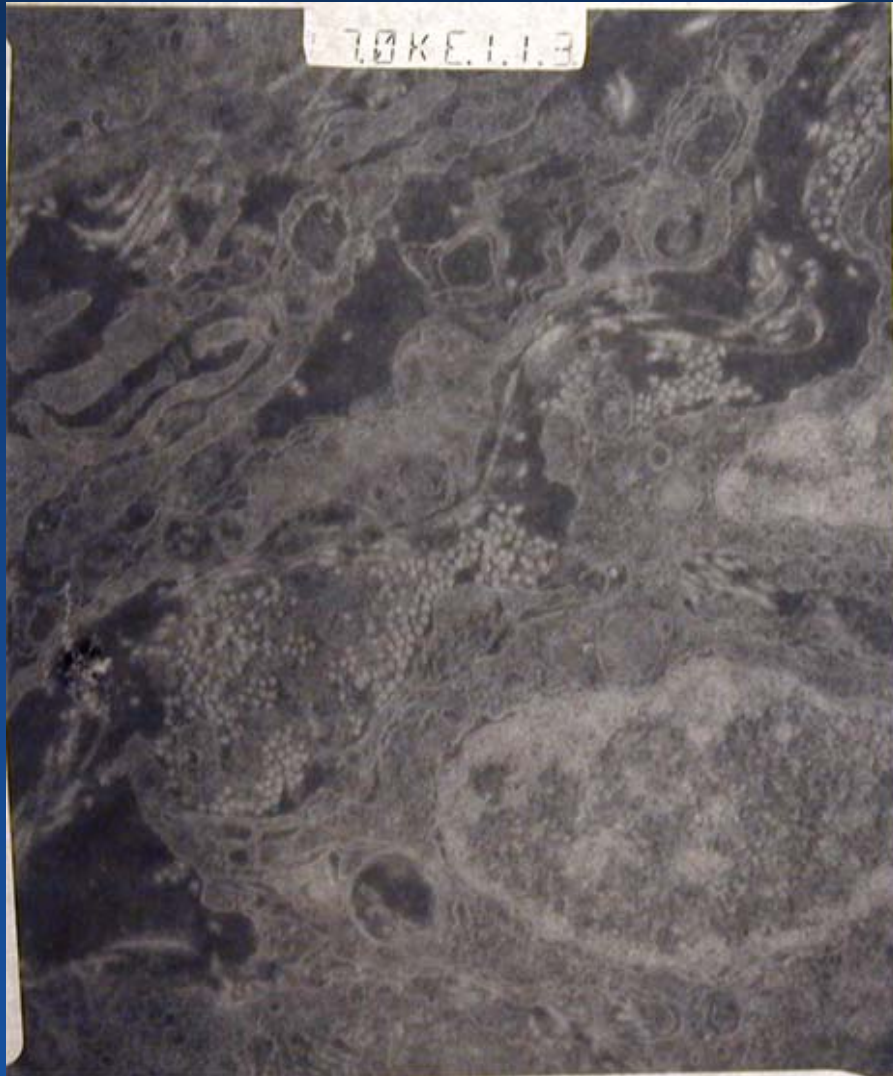


Primary Cell Culture

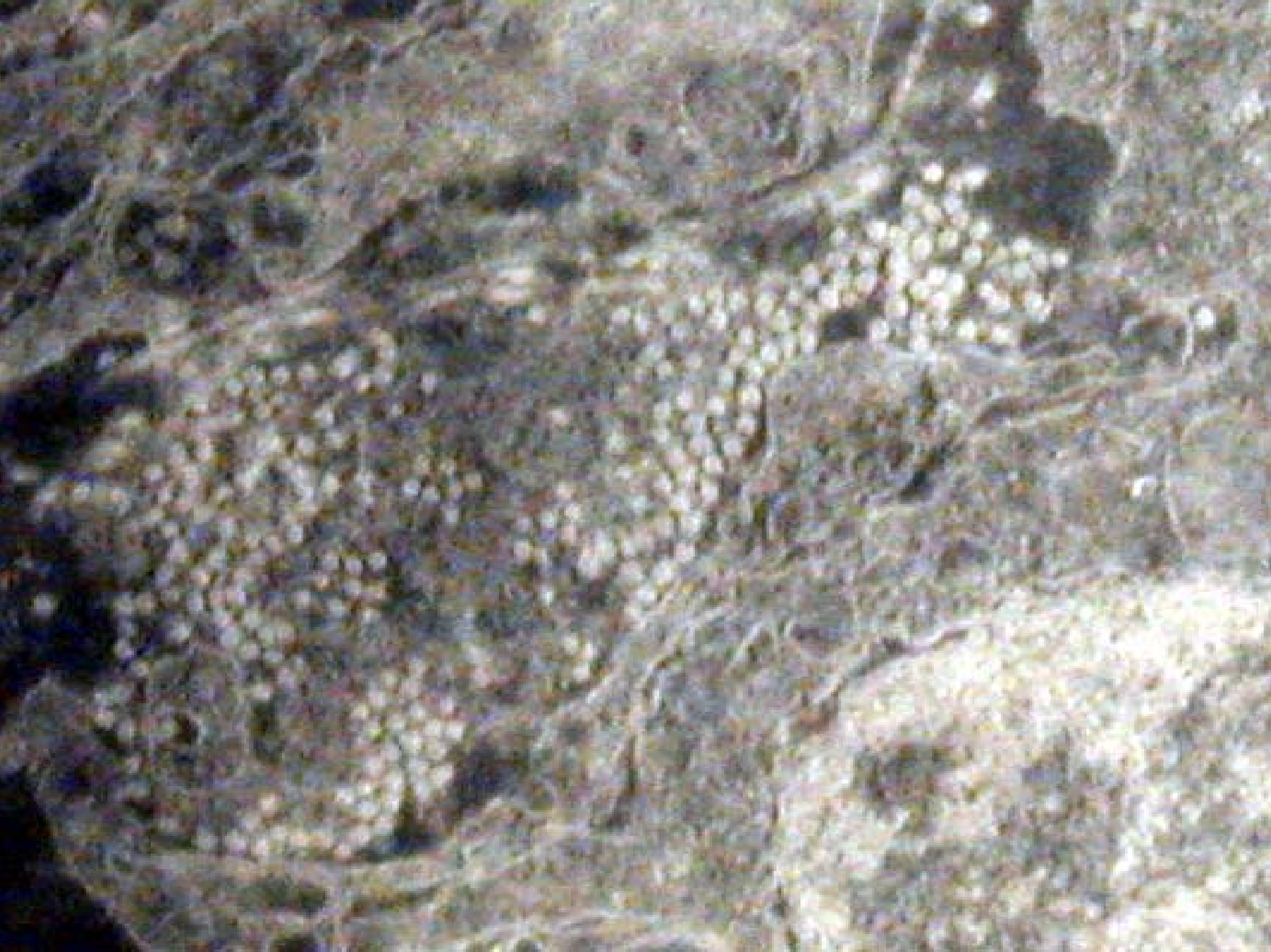
Fresh tumor tissue is cut into small pieces and incubated in a tissue culture flask

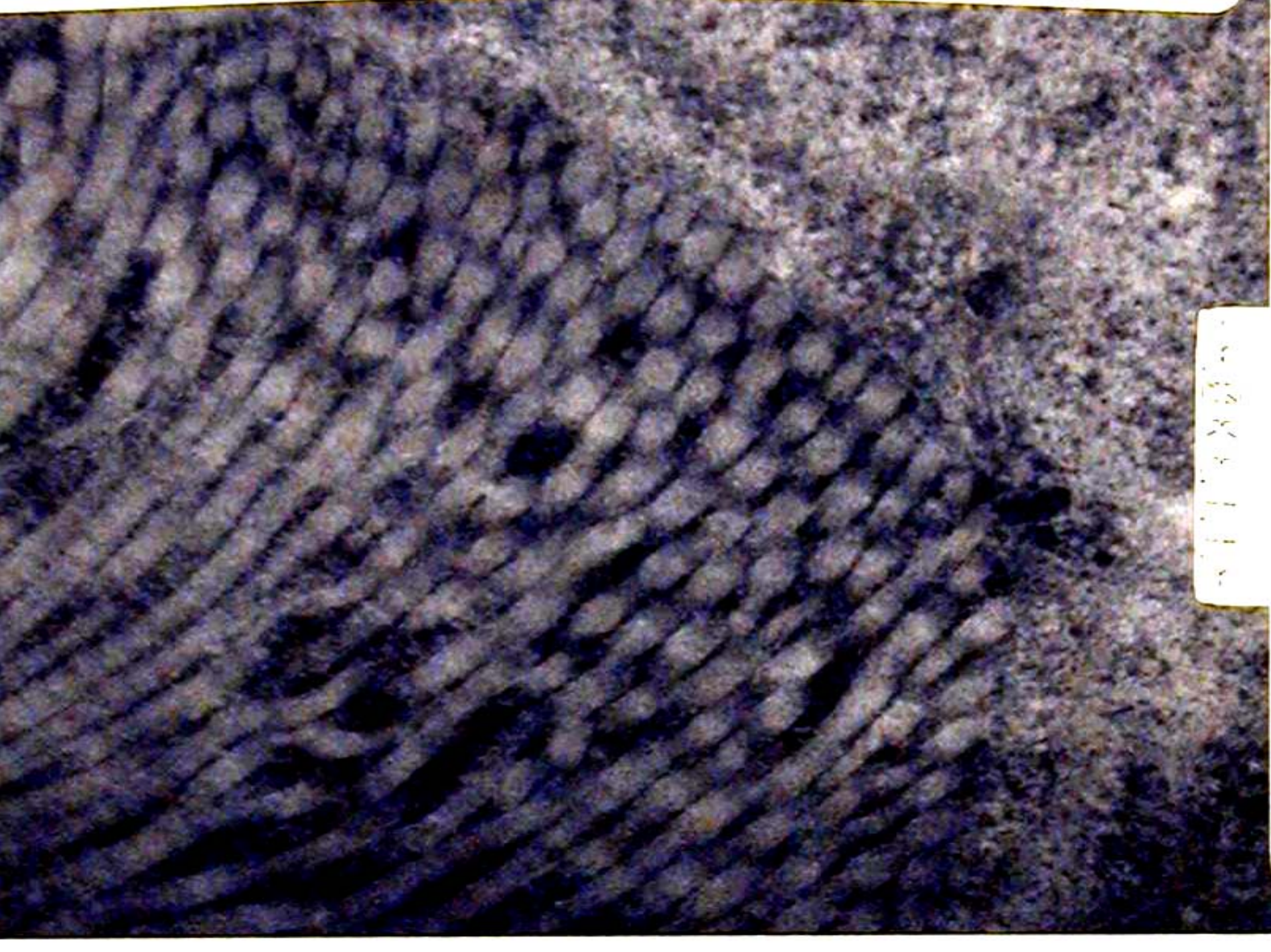


Electron Microscopy



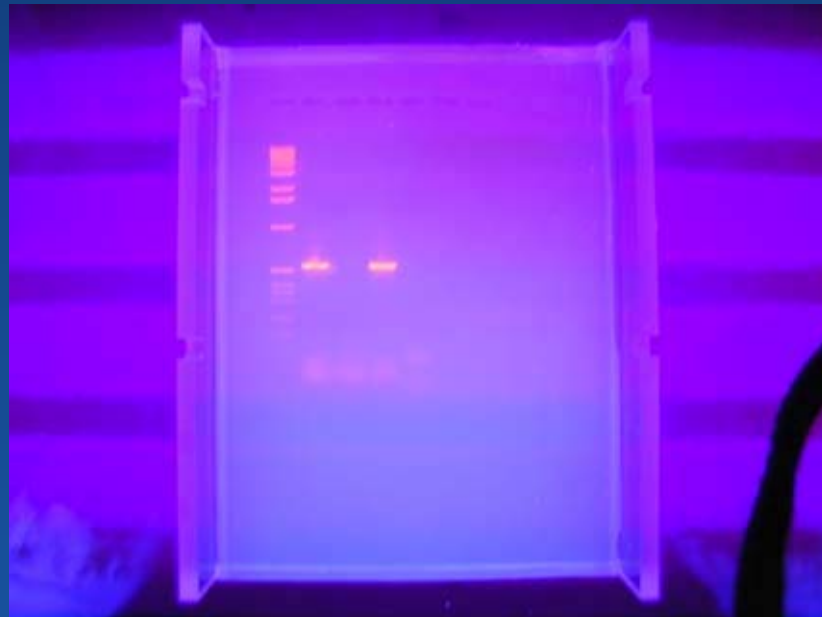
- Tumor Tissue
- Internal Organs
- Cell Culture Cells
- Primary Cells





Polymerase Chain Reaction

- Extracted DNA from Tumor Tissue
- Internal Organ Tissues
- Primary Cells and Cell Cultures
- Primers to identify OMV, *Herpesvirus salmonis*
- Assay for Reverse Transcriptase Activity



Live Fish Experiments

- Cohabitation of ChS fingerling with Affected Fish
- Injection of ChS fingerling with Whole Cell and Cell Free Filtrate of Tumor Homogenate and held for 6 months



Conclusions

- ? No Evidence of a Viral Pathogen
- ? Possible Exposure to an Inducer
- ? Possible Genetic Component

Acknowledgements

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Lookingglass Hatchery

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Paul Moran

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