

Proliferative gill inflammation (PGI) NVI's perspective

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In this presentation:

- Gill physiology and anatomy
- Common clinical and pathological findings in fish with gill diseases
- Examples of known causes of gill diseases
- Proliferative gill inflammation: a chronic, multifactorial condition



Gill physiology and anatomy

Functions: osmoregulation, nitrogen excretion, acid base balance, immune-regulation

RESPIRATION most important function of the gill

- Breathing in water vs air:
 - The density of water much greater than air
 - Airbreathers: high O₂ concentration and little energy required to breath
 - Low solubility of O₂ in water
- Increasing water temperature:
 - O₂ solubility decreases
 - The O₂ need increases in fish

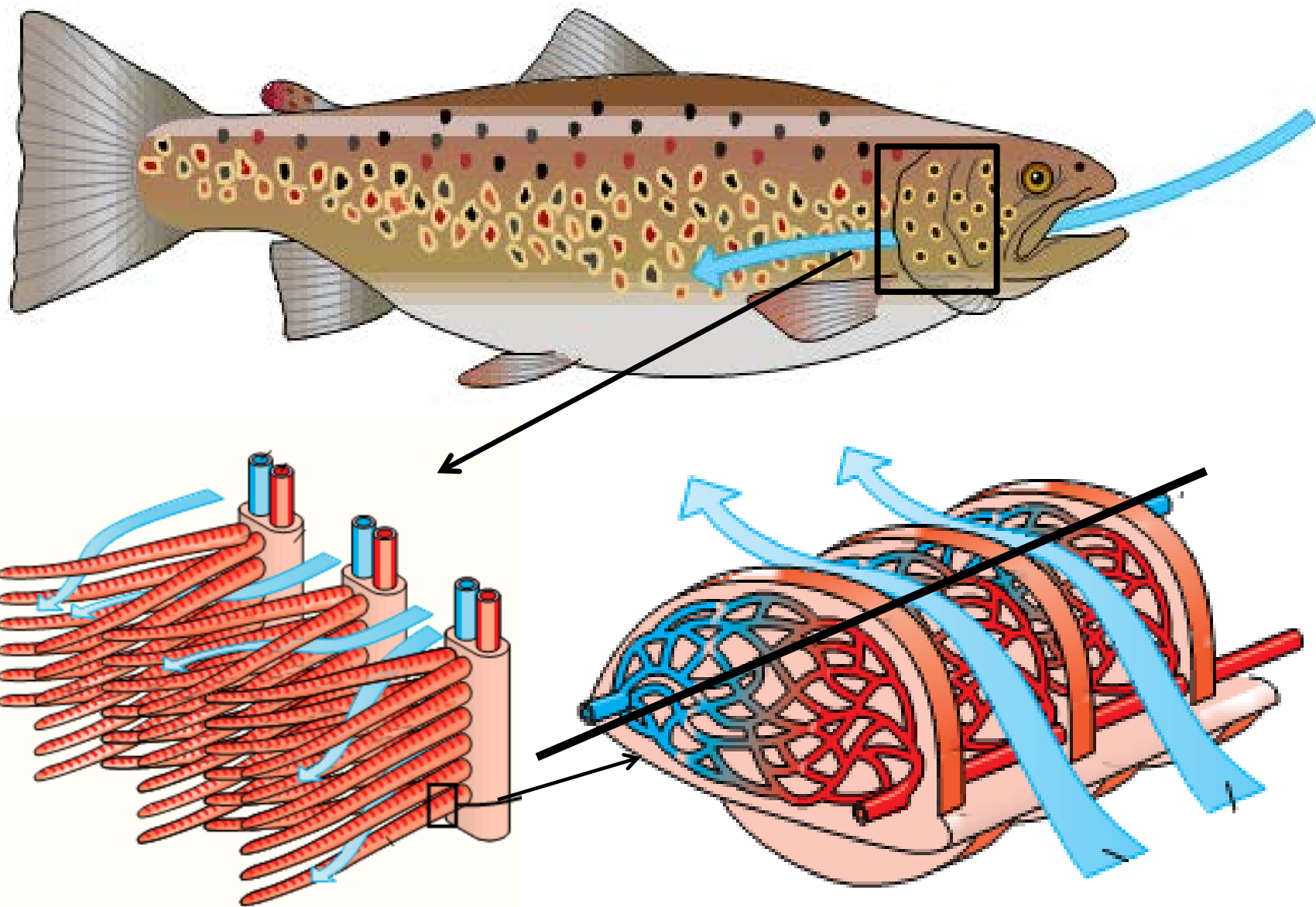
■ Therefore....

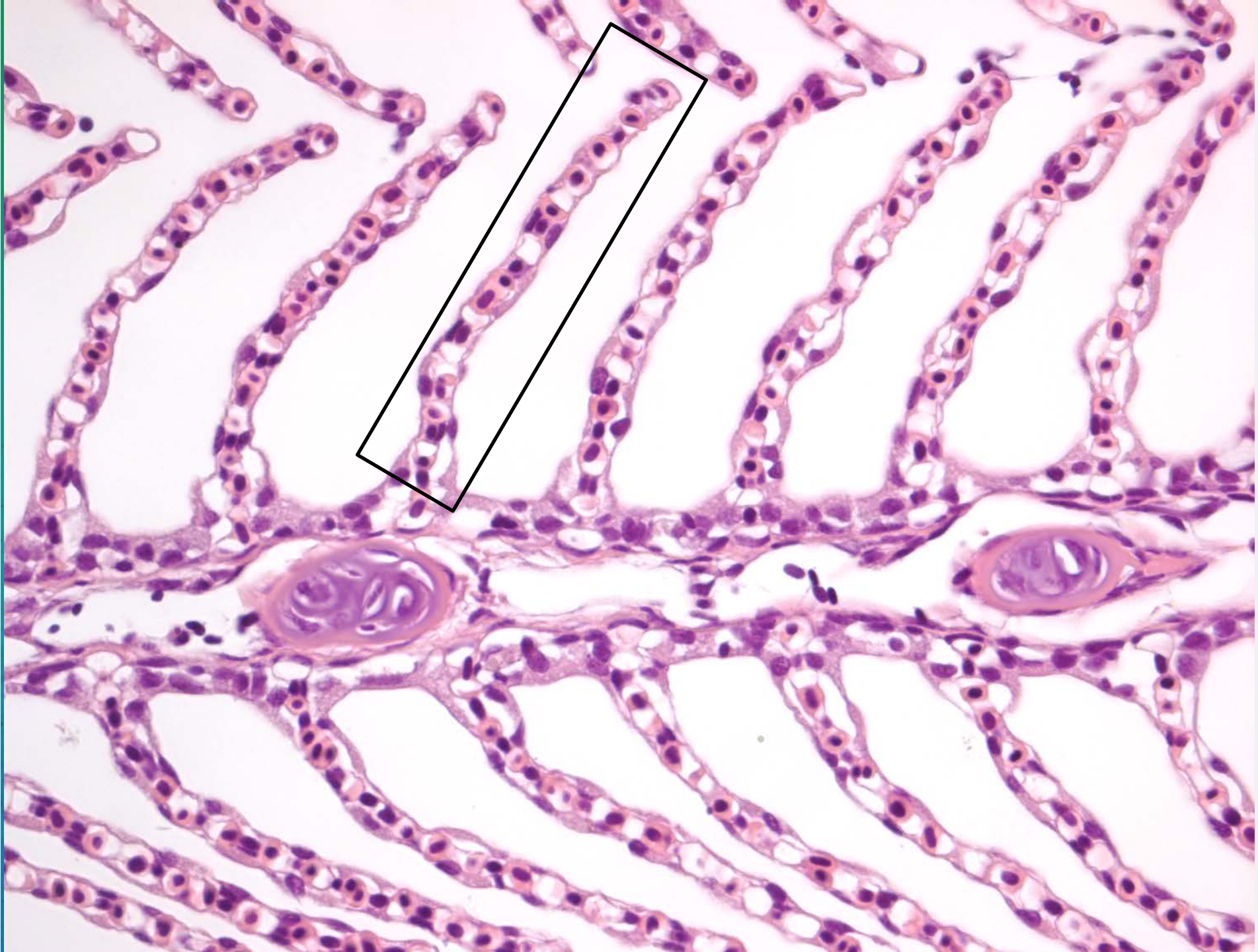


Gill physiology and anatomy cont.

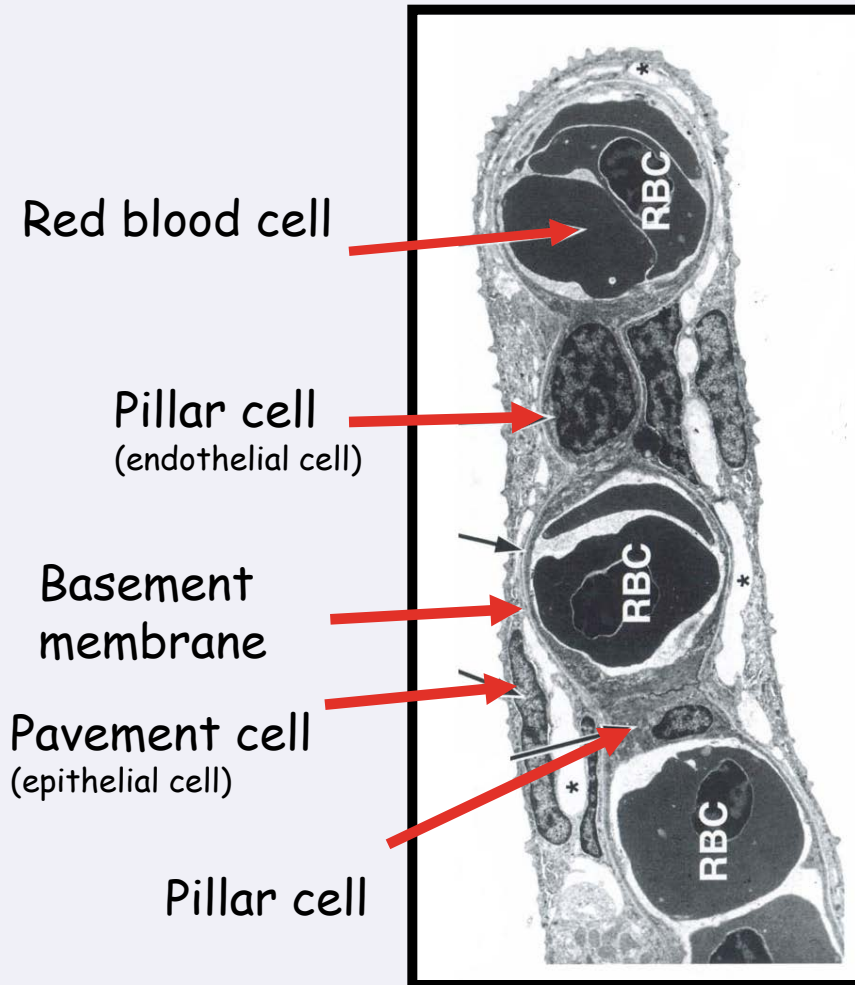
- Highly vascularized organ with large surface area
- One of the most complex circulation found in any vertebrate organ
 - Arteriovenous circulation
 - two pathways (interlamellar and nutrient)
 - Arterioarterial circulation (respiratory)
 - Three pathways (inner and outer marginal channel and lamellar sinusoid)







Gill physiology and anatomy cont.



SHORT DISTANCE BETWEEN BLOOD AND WATER: EXPOSED ORGAN

■ Common clinical and pathological observations in fish with gill diseases

- Respiratory distress and reduced appetite
- Autopsy: discoloration of the gills and no feed in the GI

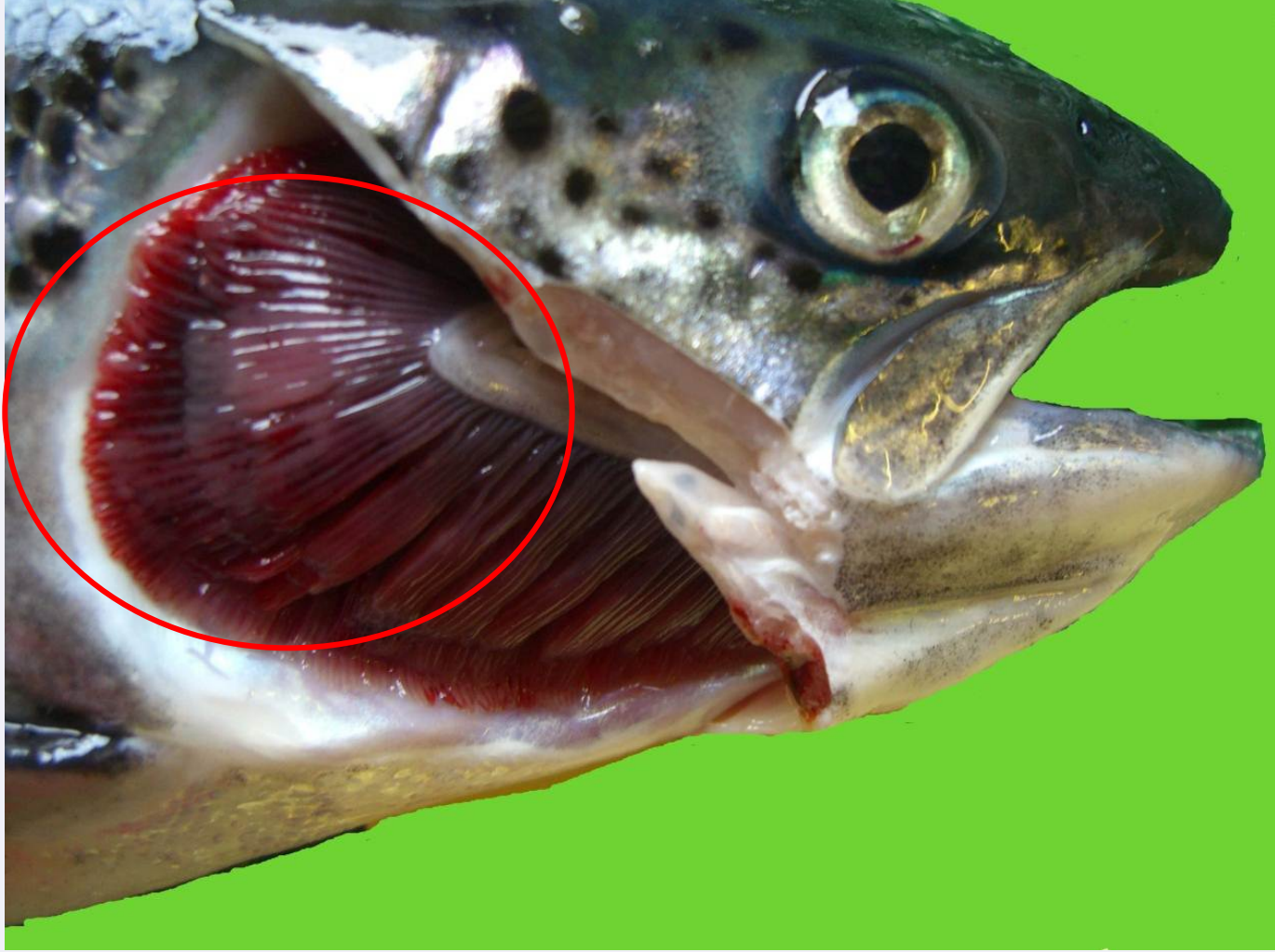
Histopathological changes

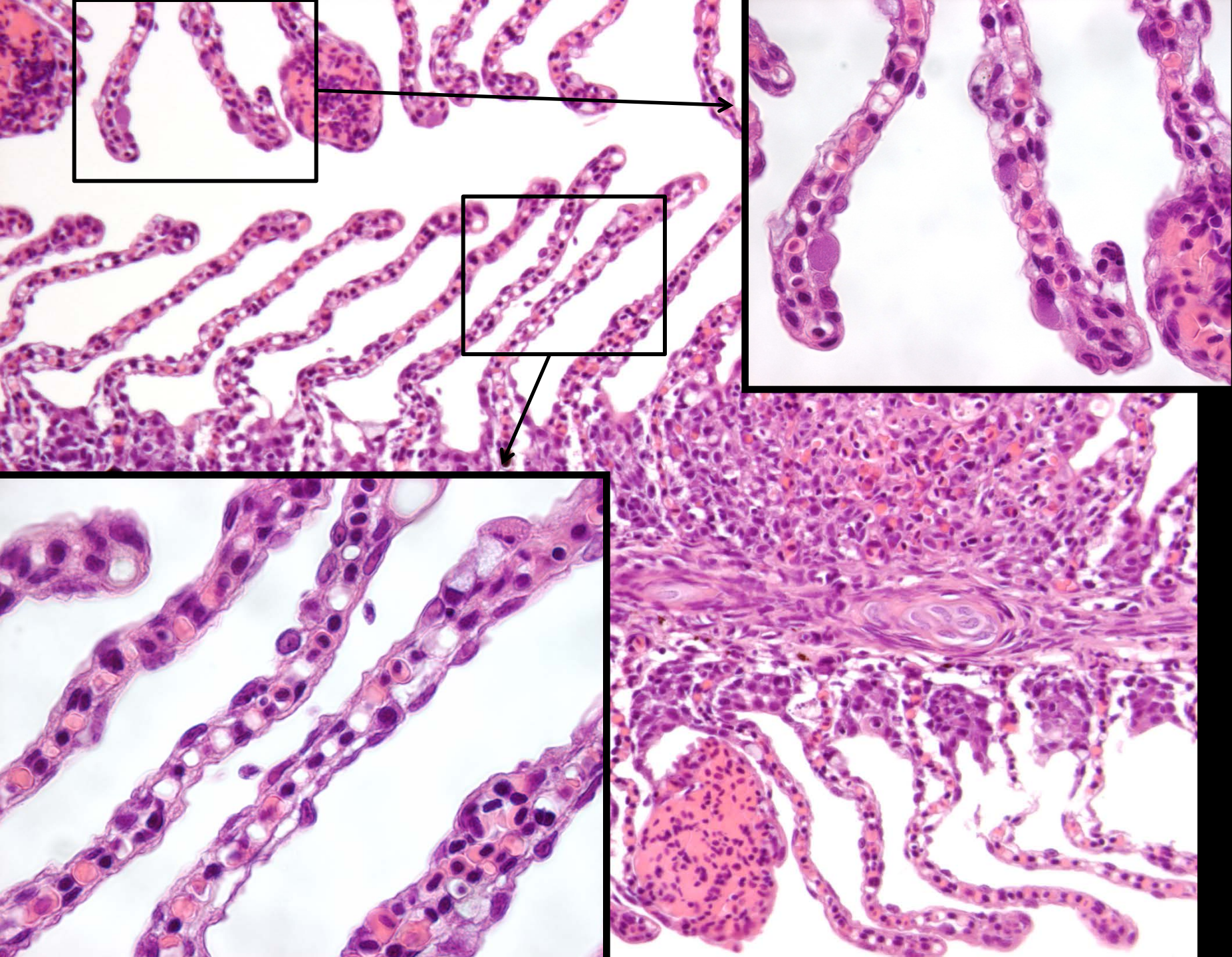
- Complex organ with different types of pathological changes
- Can be divided into two main groups;
 - Tissue damage (cell death)
 - Reactive changes (inflammation, proliferation etc)
- Often several types present
- None of the cell and tissue changes are reported as specific for one certain etiology.

Often similar changes, but different causes









Etiologies / conditions

- Infectious

- Bacteria
- Virus
- Parasites
- Mycotic

Proliferative gill inflammation (PGI):
multifactorial disease

- Non-infectious



Bacterial gill diseases: unidentified bacteria coating the gill surface

Disease history:

Fish in freshwater with reduced appetite and growth.

Autopsy: little feed in the GI

Histopathology:

Lamella coated with bacteria,
Little host reaction

Bad water quality (resirkuleringsanlegg)

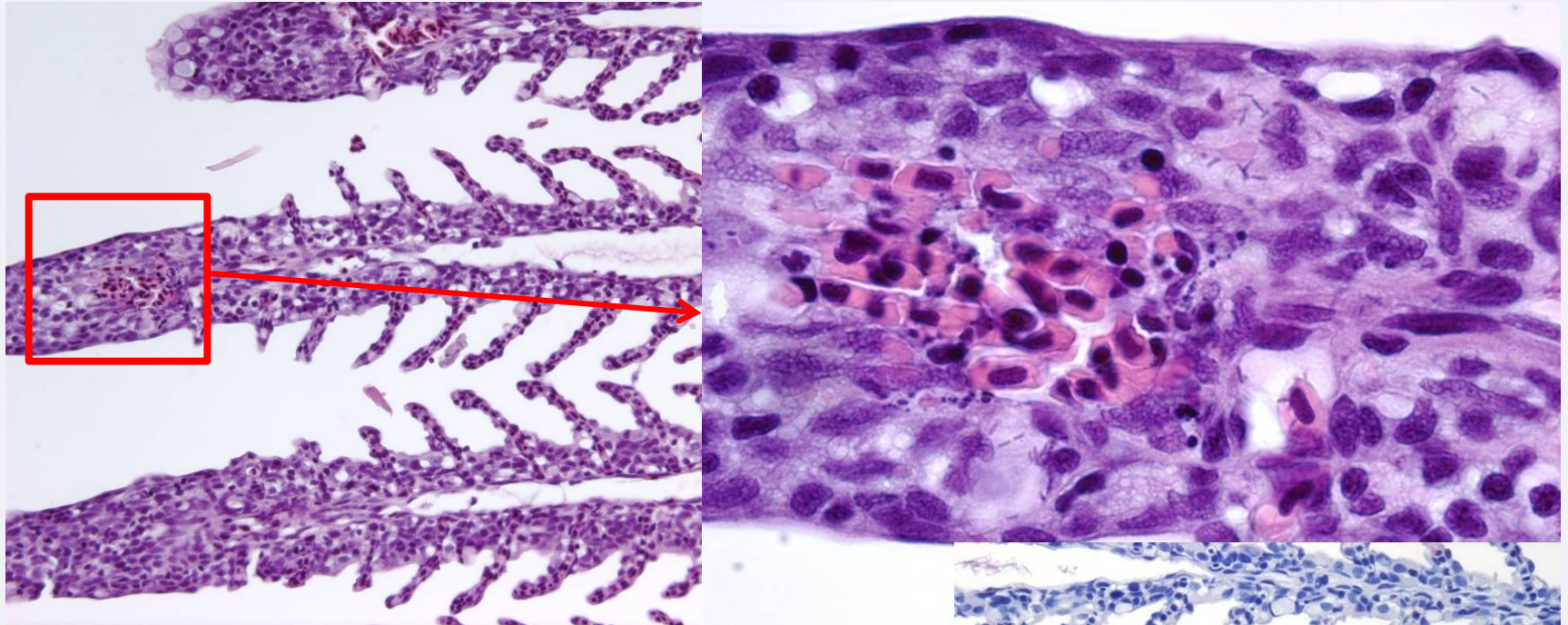
Still unknown identity-difficult to isolate because of contamination

Lamella coated with bacteria

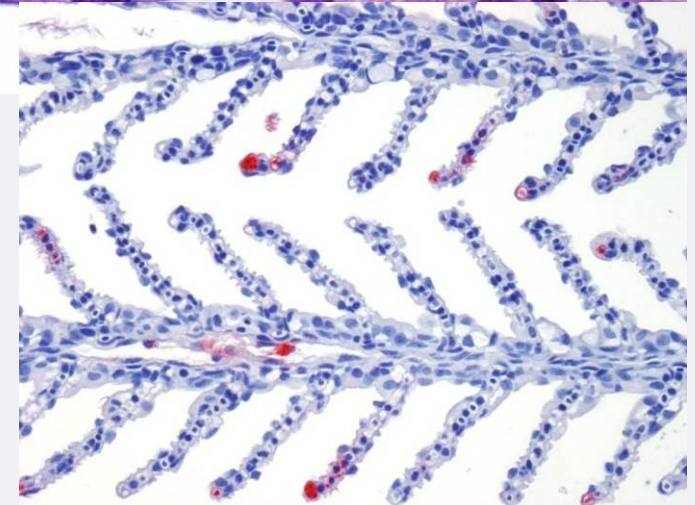


Bacterial gill diseases cont.

Yersiniosis (ENTERIC RED MOUTH DISEASE) : systemic infection



Circulatory disturbances and bacteria
in central part of filament



Photos: OB Dale



Recurrent gill problem in several smolt production units, possibly of viral etiology

- Smolt production unit with 15-20 ‰
- Increased mortality and abnormal behavior
- Histology of gills: Hypertrophic epithelial cells with enlarged nuclei and margined chromatin along the nuclear envelope



Morphogenesis of salmonid gill poxvirus associated with proliferative gill disease in farmed Atlantic salmon (*Salmo salar*) in Norway

Are Nylund · K. Watanabe · S. Nylund · M. Karlsen ·
P. A. Sæther · C. E. Arnesen · E. Karlsbakk

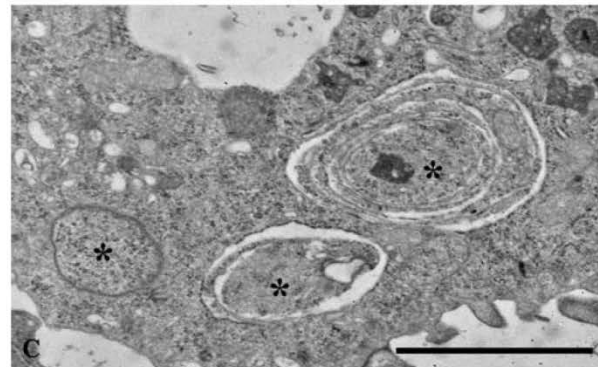
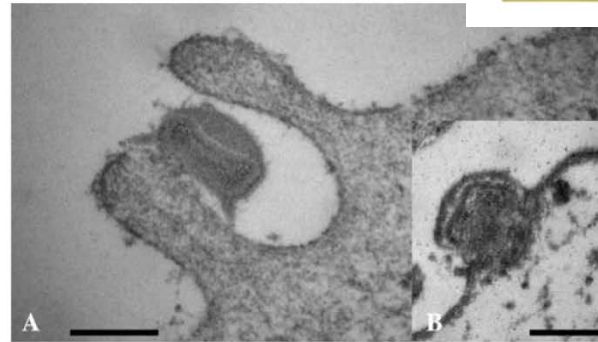
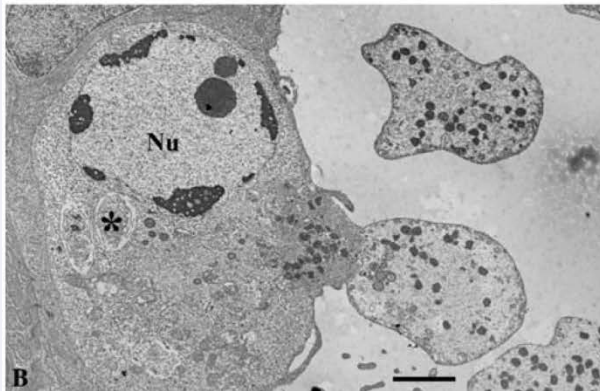
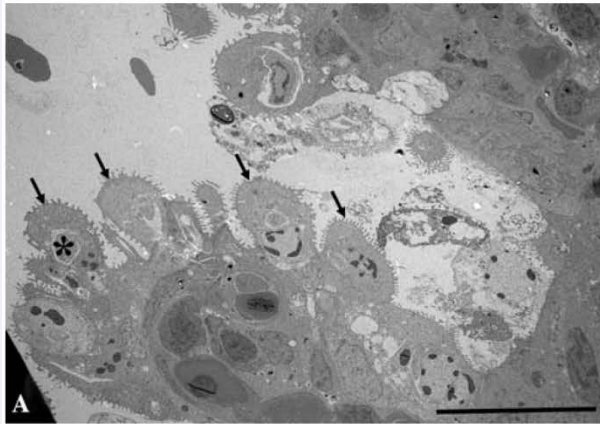
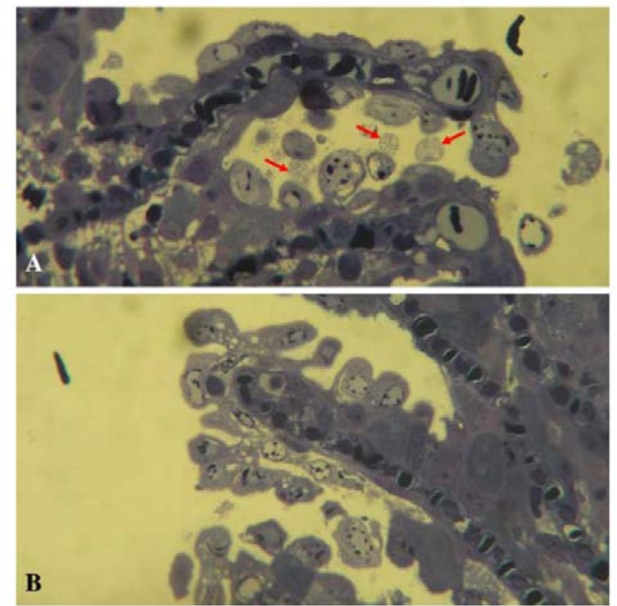


Fig. 4 Early phase in the SGP virus replication cycle. **a** Attachment of a virion (300 nm long) to a microridge on the surface of a gill epithelial cell (*bar* 200 nm). The outer membrane of the virion seems

Proliferative gill inflammation (PGI)

Microbial and pathological findings in farmed Atlantic salmon *Salmo salar* with proliferative gill inflammation

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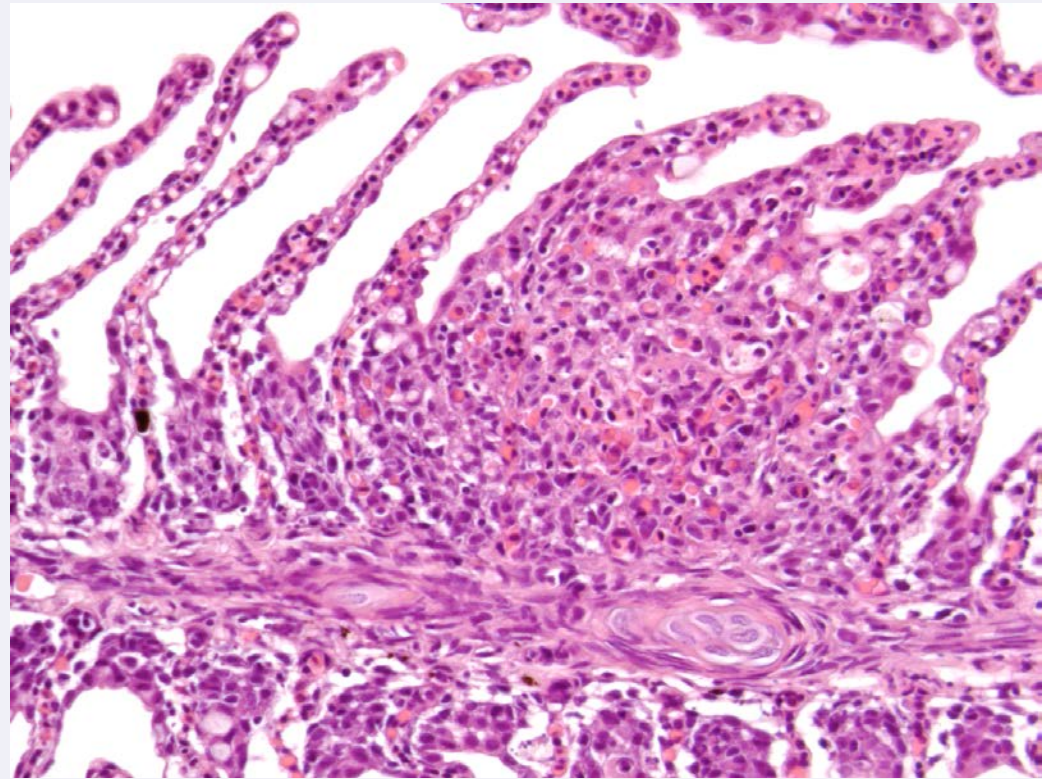
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- Occurs typically during autumn
- The disease can last for weeks to months
- Mortality from low to 40%
- Multifactorial etiology
- Epitheliocystis often present but not always
- Other agents including ASPV, POX, parasites (*Desmozoon lepeophtherii* syn (*Paranucleospora theridion*))
- Regarded as a distinct disease on the basis of pathology



Diagnostic criteria for PGI

- Cell death
- Circulatory disturbances
- Inflammation
- Proliferation of epithelial cells



PGI is end stage pathology

How did we go from here....

to here....?

