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## Cod diseases in Iceland – an overview -

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## Cod diseases in Iceland

- Infectious agents
  - Viruses → No problem 😊
  - Bacteria → Significant problem 😞
  - Fungi → Significant problem 😞
  - Parasites → Sporadic cases 😟

## Iceland

### Major diseases in cod farming

#### ○ Bacteria

Atypical furunculosis – *Aeromonas salmonicida*  
ssp. *achromogenes*  
Vibriosis – *Vibrio anguillarum*

Recurrent cases

Saddleback disease – *Flexibacter* species

Once a year  
Wild juveniles

Red mouth disease – *Yersinia ruckeri*

Sporadic cases

#### ○ Fungi

*Loma morhua*

Persistent problem

#### ○ Parasites

X-cell disease

Annual  
Wild juveniles

*Trichodina murmanica*, *T. cooperi*  
*Ichthyobodo* sp. (*Costia* sp.)  
*Gyrodactylus* spp.

Sporadic cases

### Diseases of farmed cod

#### Iceland ⇔ Other cod farming countries

		Iceland	Norway	Scotland	Newfoundland and Labrador
Viral infections	Noda-virus – VNN				
	Atypical furunculosis				
Bacterial infections	Vibriosis				
	Francisellosis				
	Saddleback disease				
	Red mouth disease				
Fungal infections	<i>Loma morhua</i>				
	<i>Trichodina</i> species				
Parasitic infections	<i>Ichthyobodo</i> species				
	<i>Gyrodactylus</i> species				
	Fish lice/ <i>Caligus</i> spp.			?	?

No problem to date

Minor problem

Significant problem

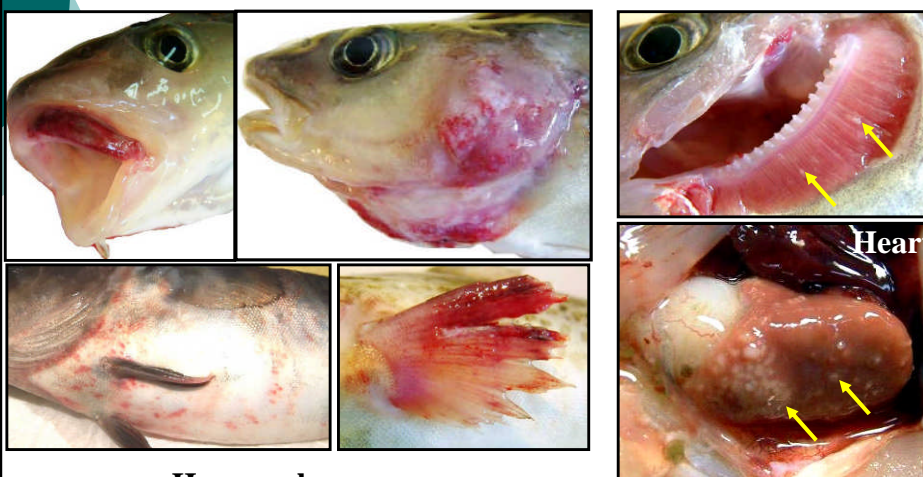
## Bacterial diseases

### Atypical furunculosis and Vibriosis

- Problem for years
  - And increasing
- To date the most serious diseases
- Recurrently diagnosed from tanks and sea cages
  - All sizes of cod affected
    - Both of wild and farmed origin
- Mortality
  - Up to 30-50% in tanks or sea cages
- Temperature range 6-14°C
  - More frequent at higher temperature

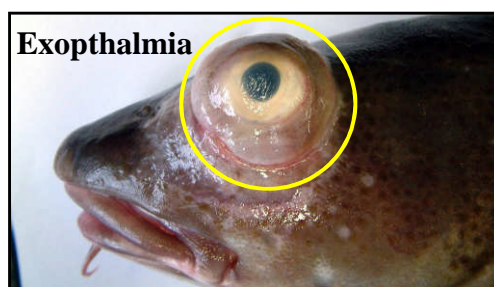
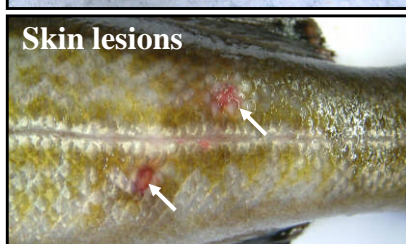
## Bacterial diseases

### Atypical furunculosis Clinical signs



Haemorrhage

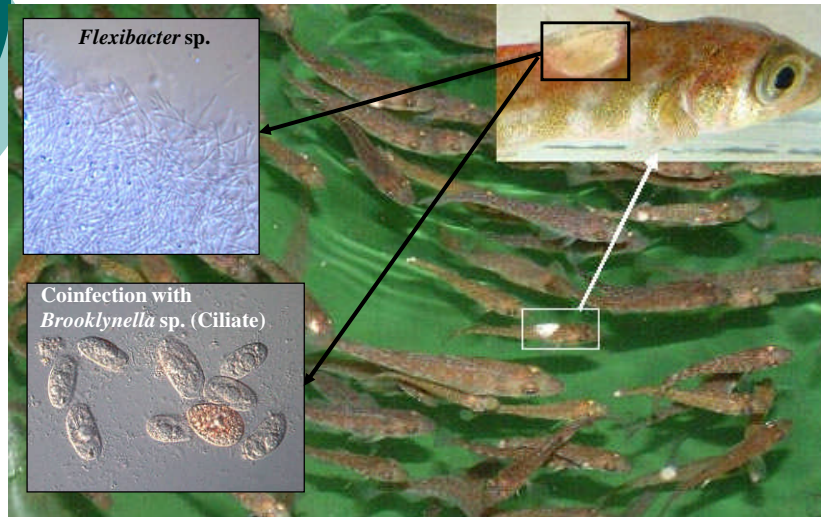
Granuloma formation

**Bacterial diseases****Vibriosis**  
**Clinical signs****Bacterial diseases****Saddleback disease**

- Problems in juveniles
  - Mortality up to 20%
- Source: Wild fingerlings caught for on-rearing
- Spreads rapidly among fish
- Antibiotic treatment not effective
- Removal of infected fish most effective

### Bacterial diseases

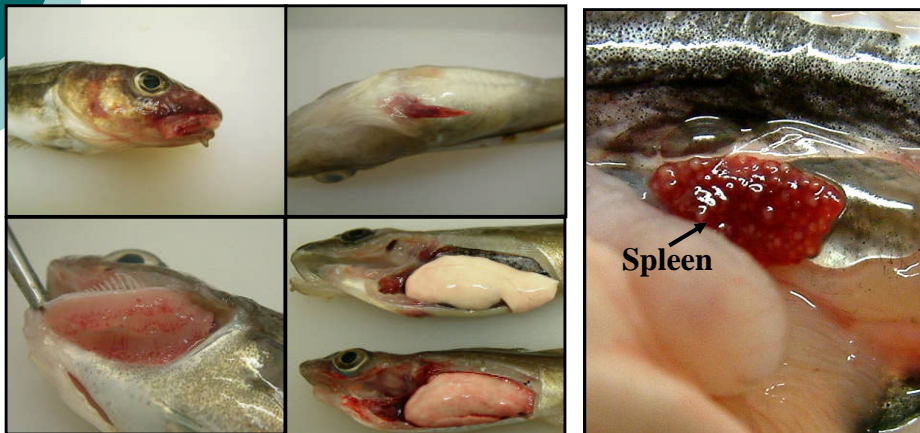
## Saddleback disease



### Bacterial diseases

## Red mouth disease

- Mortality in cod juveniles
- To date observed in 2 land based farms



Haemorrhage

Granuloma formation

## Fungi

### *Loma morhua*

- Currently a serious pathogen
- Source of infection
  - Infected wild fingerlings caught for on rearing
  - Wild fish close to sea cages
- Effective spread of infection
- Up to 65% prevalence in sea cages
- Reduced growth of infected fish
- Low but steady mortality through the rearing period
  - Considerable cumulative mortality

## Fungi

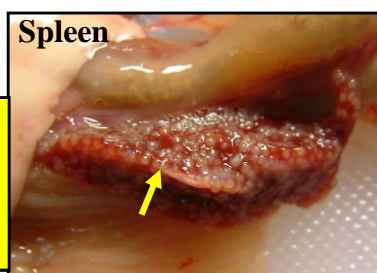
### *Loma morhua*

#### Clinical signs



**Gills**

**Granuloma  
formation  
in various  
organs**



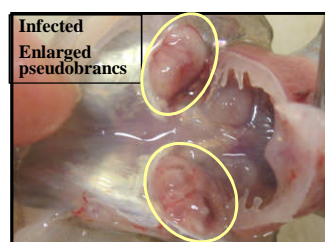
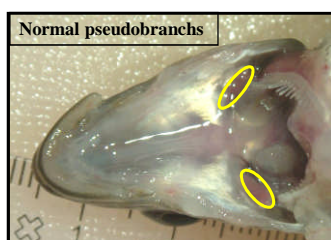
**Spleen**



## Parasites

### X-cell disease in pseudobranchs

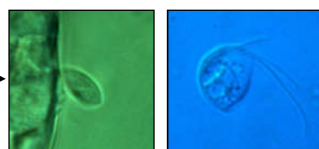
- Causative agent – a micro-parasite
- Source of infection
  - Infected wild fingerlings caught for on rearing
- Route of infection unknown
  - No sign of direct transmission between fish
- Infected fish emaciate and die
- Mortality: Approx. 2-5%



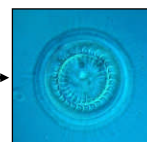
## Parasites

### Sporadic cases - Presently of minor significance -

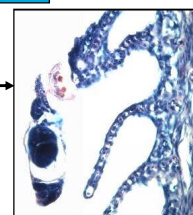
- *Ichthyobodo/Costia* sp.
  - Infects gills
  - Reduces function of gills



- *Trichodina* species
  - Infects gills and skin



- *Gyrodactylus* species
  - Reduces function of gills
  - Micro erosion of skin



**Bath treatment generally effective**

## Diseases of cod

### Prophylaxis and treatment

#### **1. Vaccine available:**

- Vibriosis – *Vibrio anguillarum*

#### **2. Lack of effective vaccine:**

- Atypical furunculosis – *A. salmonicida* ssp. *achromogenes*

#### **3. Antibiotics or chemical agents for:**

- Most bacterial infections
- (Saddleback disease – *Flexibacter* sp.)
- Ectoparasites

#### **4. No vaccine – no treatment:**

- *Loma morhua* (fungus)
- X-cell disease in pseudobranchs

**Thank you for your attention**





**Fungi**

***Loma morhua***

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**Newfoundland and Labrador**

- Only fish from hatchery used
- Source of infection: wild fish in the sea cage surroundings

**Example from a study (Khan xx):**

- 1-7% prevalence in wild cod surrounding the sea cages
- 78% prevalence in slaughtered fish
- Lower condition factor of infected fish
- Considerable problem in cod farming in Newfoundland and Labrador