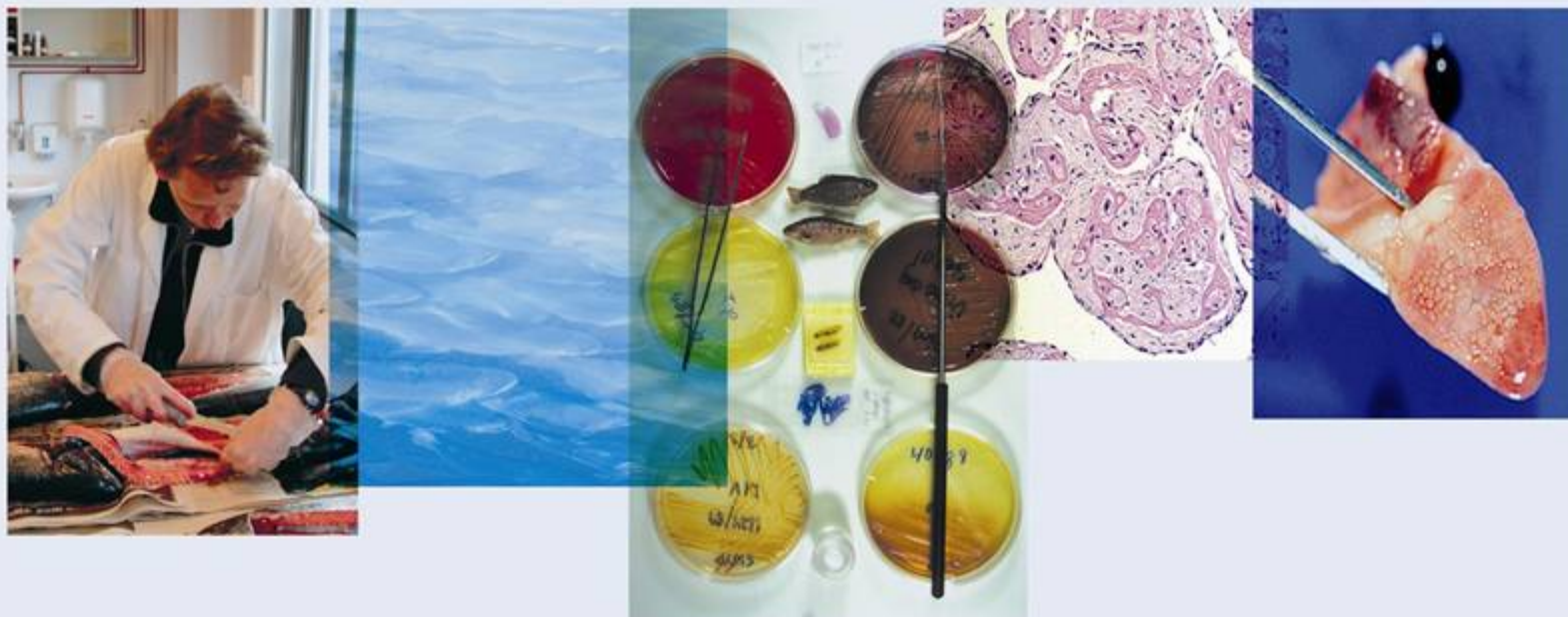


Identifying and Prioritizing Hazardous Diseases and Evaluating Risks

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National Veterinary Institute, Norway



IABC Trondheim, Norway 2009



Veterinærinstituttet
National Veterinary Institute

Outline of the talk

- Briefly about the principles in risk analysis
- Collecting information
- Emerging diseases and risk assessment
- Examples on ongoing risk assessments
- Risk managing and risk communication



Risk Analysis

“Risk analysis is a tool intended to provide decision-makers with an objective, repeatable and documented assessment of the risk posed by a particular course of action “

MacDiarmid 1997



Risk Analysis

- What can go wrong?
- How likely is it to go wrong?
- What would be the consequences of it going wrong?
- *What can be done (effect of alternative measurements)*



Risk Analysis can be qualitative or quantitative

- Quantitative Risk Analysis:
high, medium, low, insignificant /negligible risk
for something to go wrong

- Quantitative Risk Analysis :
 - *Numbers*
 - 100% chance
 - 10% chance
 - 0,1% chance
 - 0,00000000001% chance



Risk

“ The likelihood of the occurrence and the likely magnitude of the biological and economical consequences of an adverse event or effect to animal or human health ”

OIE Aquatic Animal Health Code 2009

Risk: probability * consequences



Risk Analysis

- Risk analysis is a tool to handle uncertainties, but also a process
- “..... a risk assessment is designed to focus debate on the specific risk steps which must be met before a disease introduction occurs”
- The process should be:
 - Objective, but there will be judgements
 - Predicative
 - Transparent



Risk Analysis is based on probabilities due to:

■ Uncertainty

- Lack of knowledge
- Measure errors
- Different opinions

Can be reduced by improved knowledge

■ Variability

- Normal biological variation in the population

Can not be reduced -

■ Important to communicate uncertainty



“Transparency is essential because data are often uncertain or incomplete and, without full documentation, the distinction between facts and the analyst’s judgement may blur.”

OIE Aquatic Animal Health Code 2009



Risk analysis are used to

- Assess import /exportation risks (Import Risk Analysis)
- Assess risk for spread of disease between populations
 - wild/farmed, farmed/farmed, wild/wild
- Identify and prioritize possible hazardous/emerging diseases and evaluating risk and need for biosecurity measures



Emerging disease

“A new disease, a new presentation of a known disease (e.g. increased severity, apparent in a new species) or an existing disease that appears in a new geographical area (Brown, 2000)”



Do we need to do something?

- what kind of measures that will need to be applied
- which options are available to manage risks
- what is the effect of each measure on the level of risks
- the relative effect on the different steps in the pathway (sensitivity analysis)



Risk Analysis

- Hazard Identification
- Risk Assessment - Evaluating Risks
- Risk Management
- Risk Communication



Hazard Identification:

A hazard is something which is potentially harmful to humans, animals/fish, plants or the environment. It can be an object or a process

Hazardous Diseases

Identify the pathogenic agents that could potentially produce adverse (severe) consequences



Collecting information on the Fish Health Situation

- Pathogen (or disease) targeted (active surveillance)
 - documentation for freedom of disease (VHS/IHN)
 - prevalence estimation
 - screening

- Risk based surveillance

- Health control (passive surveillance)
 - routine control
 - mortalities and disease sign



Most of the information of the fish health situation is collected through targeted diagnostics of moribund/dead or abnormal fish



Fish Health Services



Diagnostics and mandatory routine inspections
Private fish health companies

Several companies employ their own fish health
service people

Competence, integrity and ethical standard
is crucial



The Norwegian Food Authorities

- Mandatory inspections
- Increased mortality
- Suspicion of notifiable or other serious diseases



National reference laboratories

Diagnostics

Notifiable diseases

Surveillance programs

Research



Coordination of disease information

- All parties should be obliged to submit disease information included university research groups
 - listed diseases/non listed diseases
 - new and emerging diseases
 - production related diseases

- Disease information must be collected and coordinated



Diagnostic Criteria

Listed diseases. OIE manual
National listed diseases.

New emerging diseases. NRL

- ISA and PD
- HSMI. TriNation

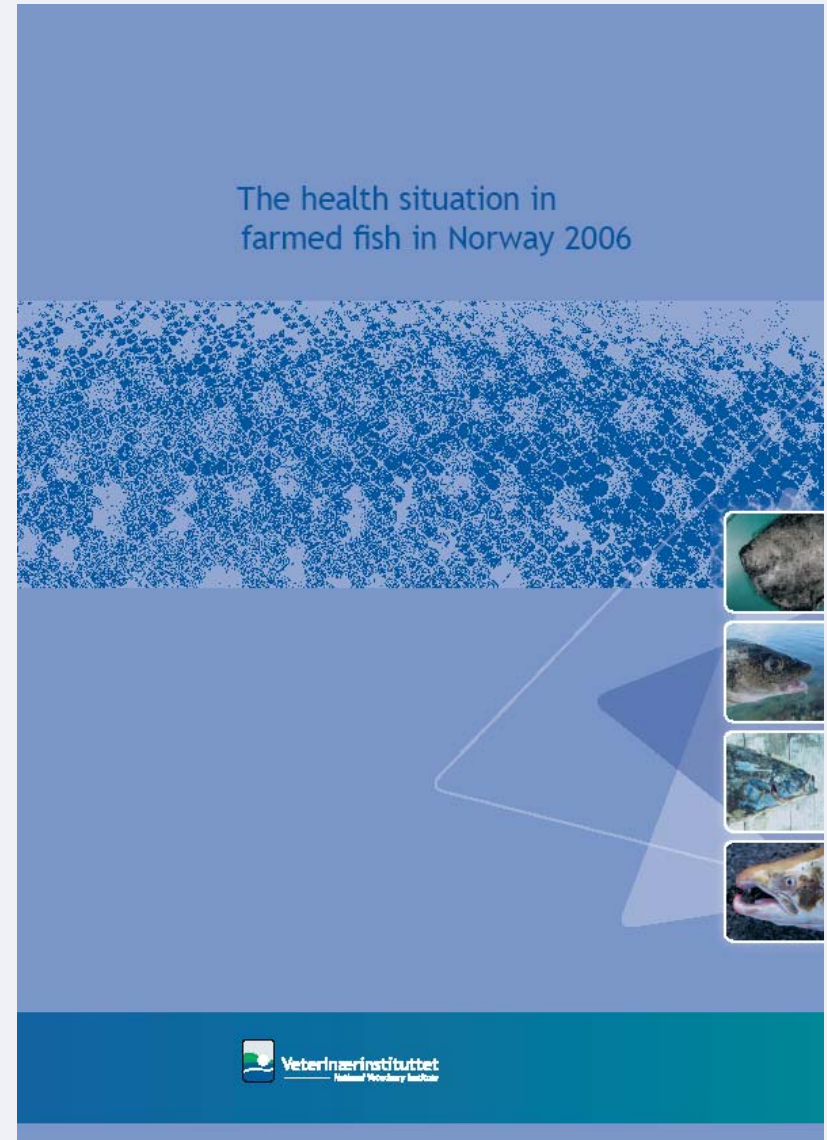


Diagnostic work at the National Veterinary Institute

Information and opinions from:
Fish Health Services nationwide

The Norwegian Food Safety Authority

Norwegian Research Institutions



www.vetinst.no

MFISH -surveillance system

Aims:

- collect and collate standardized disease and disease-related information for
 - statistical and geographical web-presentation of listed diseases
 - reporting frequencies and trends of non-listed (and non-specified) diseases for governmental and industrial use



Information on Fish Health

- Information on diseases is sensitive information
 - several of the fish farming companies are listed on the stock market
 - fish health professionals have lost contracts after a serious disease has been diagnosed
- A confirmed diagnosis can result in restrictions concerning:
 - movement of fish
 - following
 - slaughtering of fish
 - trade
- A system for compensation facilitate the collection of disease information
- Supervision of fish health professionals is important



Risk assessment

- Release assessment
 - the pathways of introduction to new area
- Exposure assessments
 - the pathways for spreading in new area
- Final probability estimate of release and exposure
- Consequence assessment
 - implication of spreading
- Risk estimation
 - Probability * consequences



Release Assessment/Exposure Assessment

- The nature of the disease
 - infectious
 - non infectious
 - Transmission trials with ISA (Thorud and Djupvik, 1988)
 - HSMI

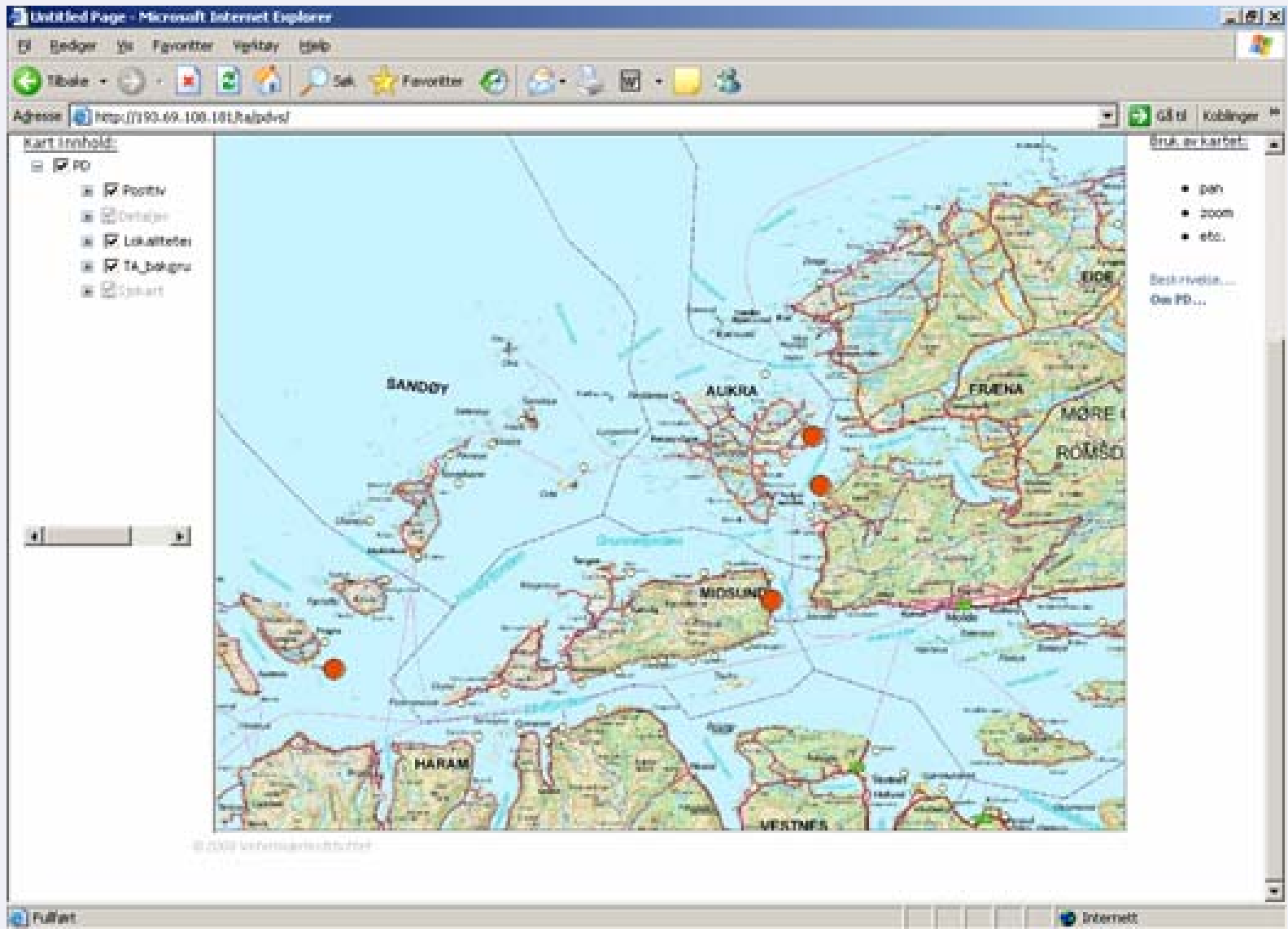


The need for facilities to perform standardized infectivity trials with potential high risk pathogens



VESO, Vikan

Release Assessment/Exposure Assessment



Release Assessment/Exposure Assessment

Transportation (well boats etc)
Currency and other environmental factors
Horizontal/vertical transmission
Survival of the pathogen (IPNV, ISAV)
Number of susceptible hosts
Host range
Natural reservoir

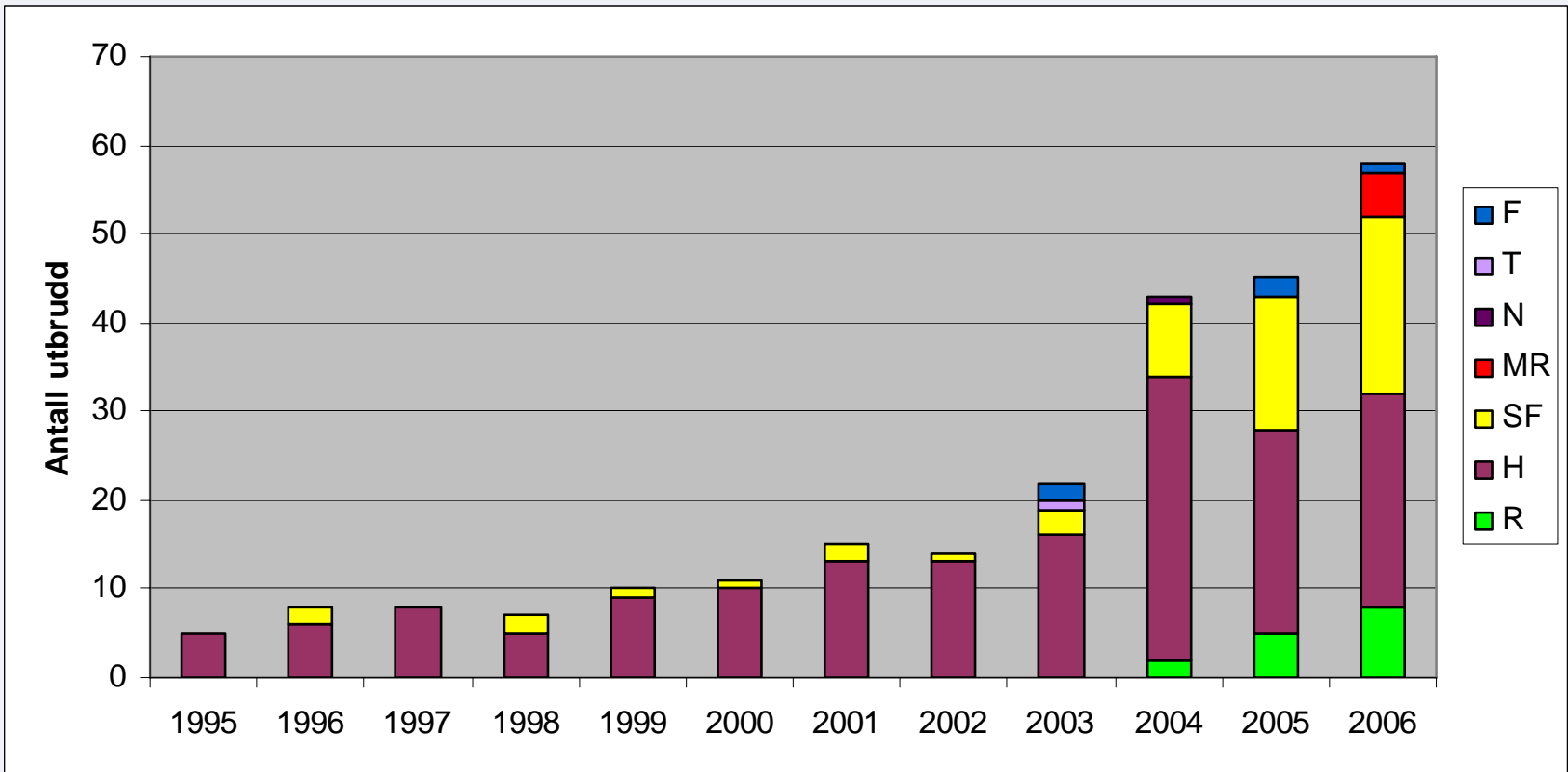


Release Assessment/Exposure Assessment

- Geographical distribution
- Trends in geographical distribution

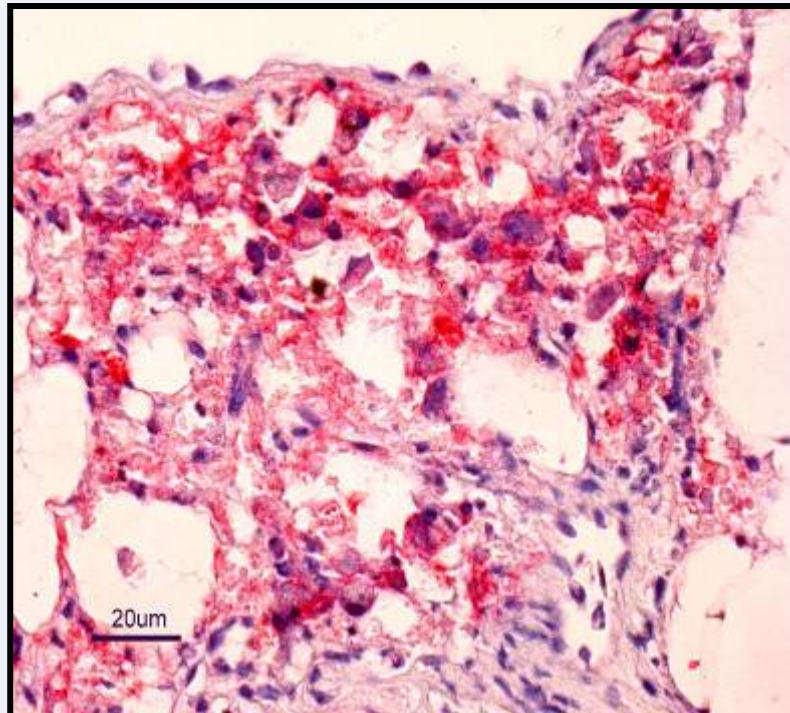


Localities diagnosed with Pancreas Disease 1995-2006



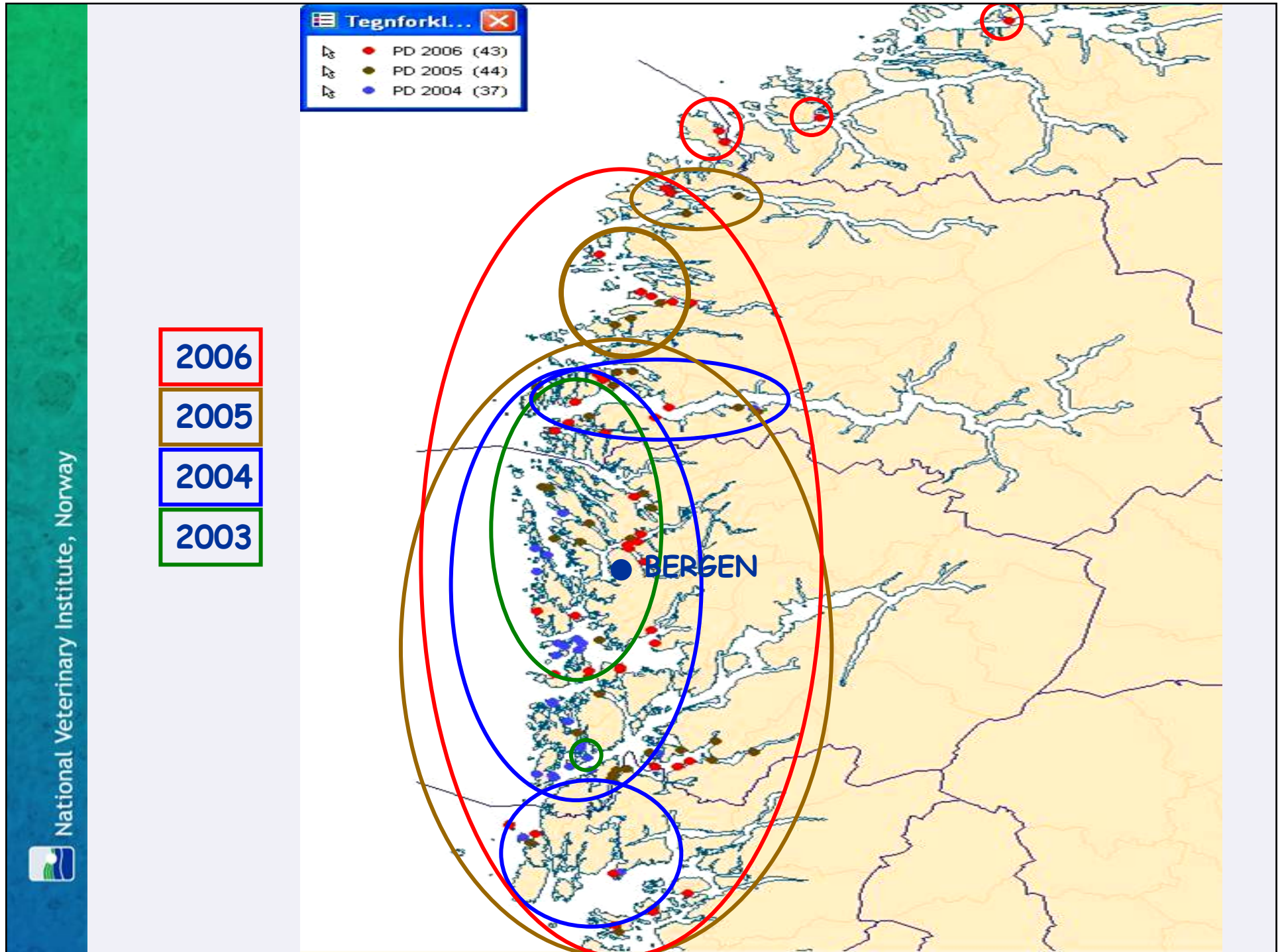
Pancreas Disease (PD)

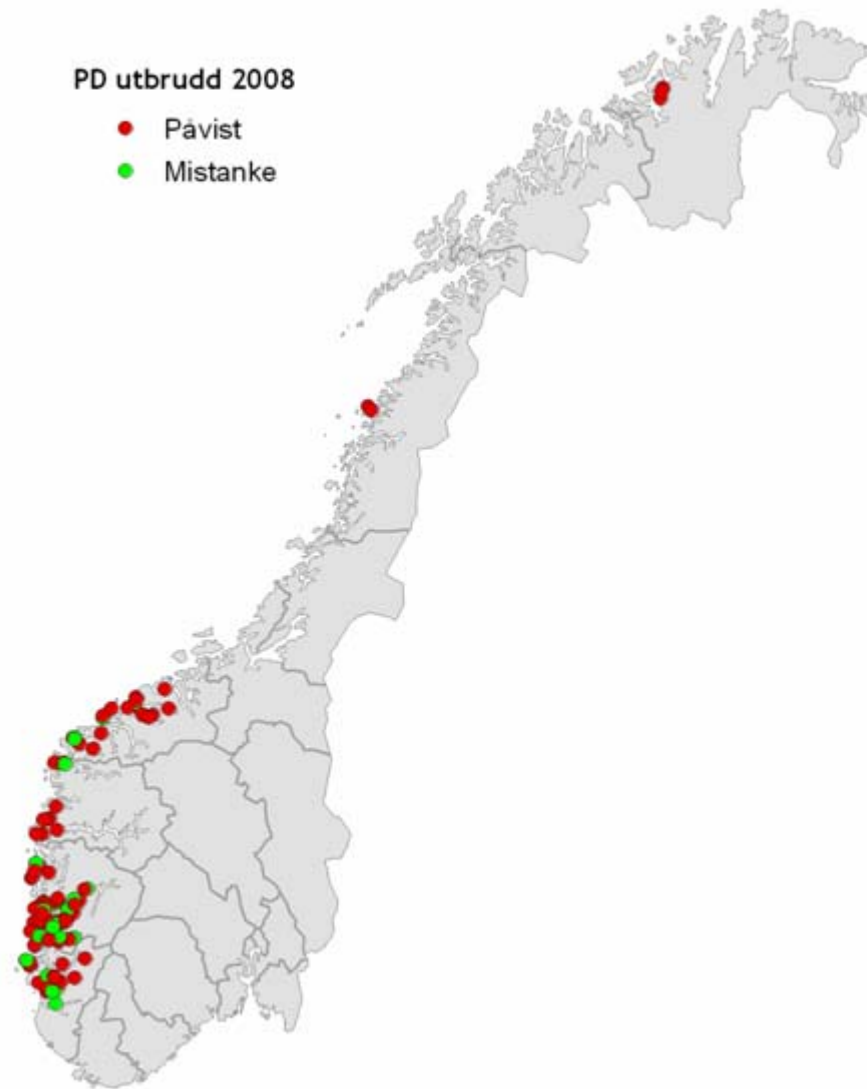
1998 -	7
1999 -	10
2000 -	11
2001 -	15
2002 -	14
2003 -	23
2004 -	43
2005 -	45
2006 -	58
2007 -	98
2008 -	109



A notifiable disease in 2007







Consequence assessment

- Direct consequences
 - Production losses and facility closure
 - Consequences to the environment
 - Fish welfare
 - Public health consequences

- Indirect consequences
 - Surveillance and control costs
 - vaccines, medication
 - Compensation costs
 - Adverse market and consumer reactions



Consequence assessment

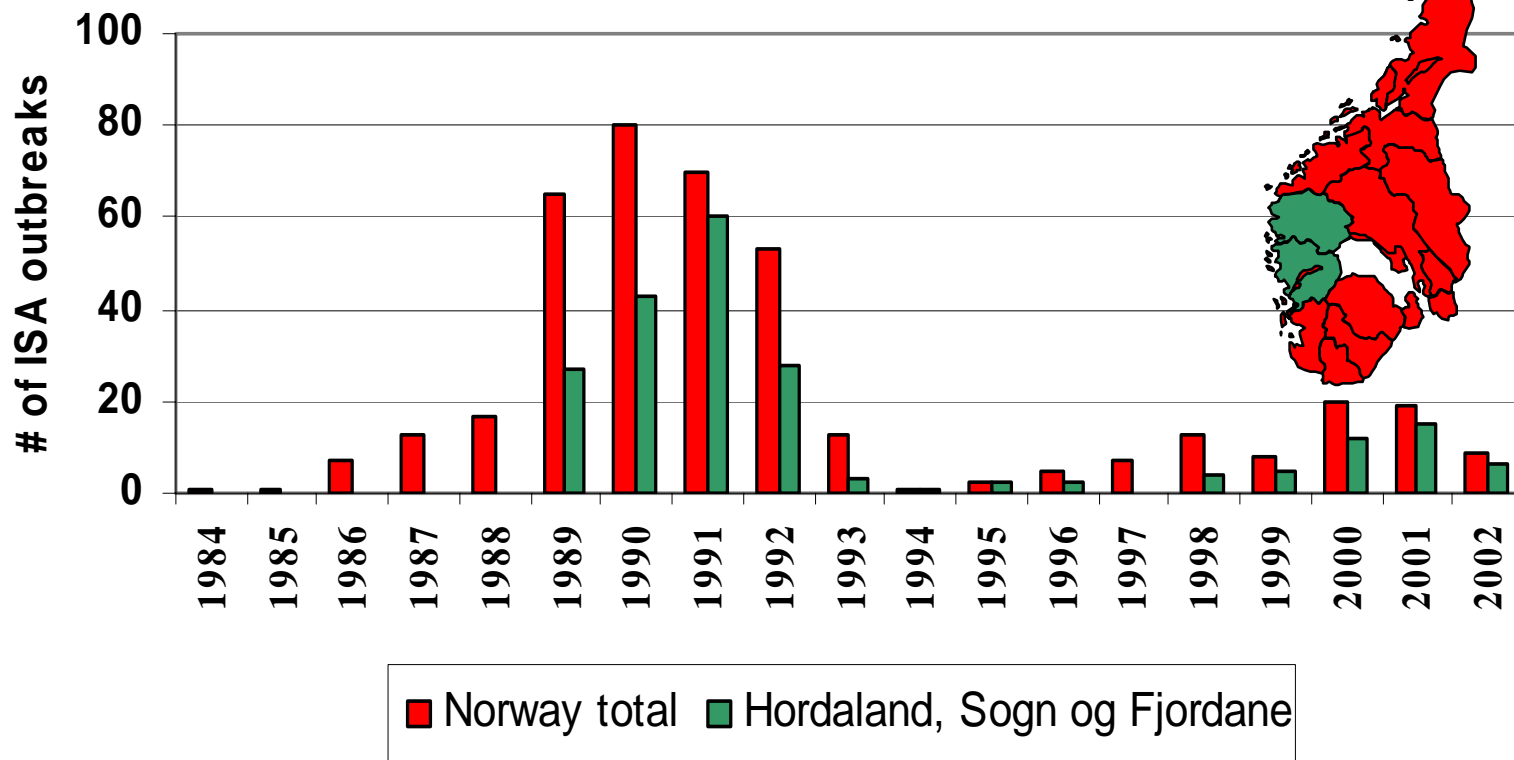
- For some diseases there are agreed standards and brood agreement concerning the likely consequences (OIE)
 - Koi Herpesvirus Disease (KHV). Indonesia 2002
 - WhiteSpot Disease. Brazil 2005

- New and emerging diseases pose a particular problem because there is often limited information
 - ISA in late eighties
 - PD in 1995-2002



Prevalence of ISA in Norway

Including counties of Hordaland and Sogn og Fjordane 1984-2002



Source: Norwegian Animal Health Authority,
County Veterinary Office, 2002

Evaluating Risks - Risk Modelling

- Historical data
- Future modelling should include both biological and economical impact (E. Brun et al)
- Should not be restricted to one site/one farm or an epidemiological compartment
- Should include future possible losses for a epidemiological geographical related area
- The interface between risk assessments and risk handling
- Could facilitate the communication with the industry



Direct consequences

- The capacity of the pathogen to produce disease or mortality
 - low virulent
 - high virulent

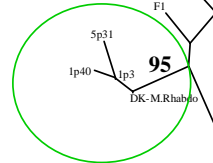
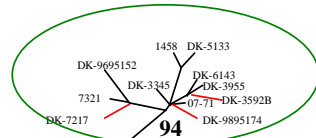
- Transmission trials with VHS genotype III (Dale et al 2009)





Genotype I (n= 88)

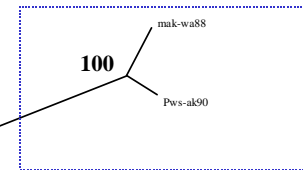
Genotype Ia (n=21)



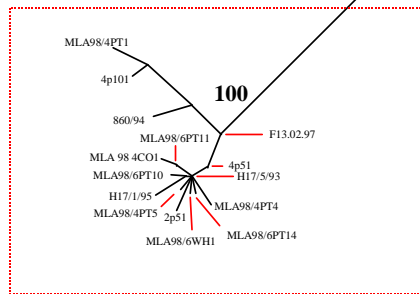
Genotype Ib (n=65)

Snow, Bain, Black, Taupin, Cunningham, King, Skall & Raynard (2004) Genetic population structure of marine viral haemorrhagic septicaemia virus (VHSV). Diseases of Aquatic Organisms 61, 11-21.

Genotype IV (n=3)

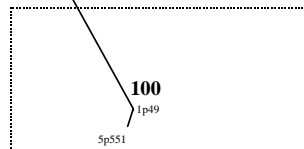


Genotype III (n=30)

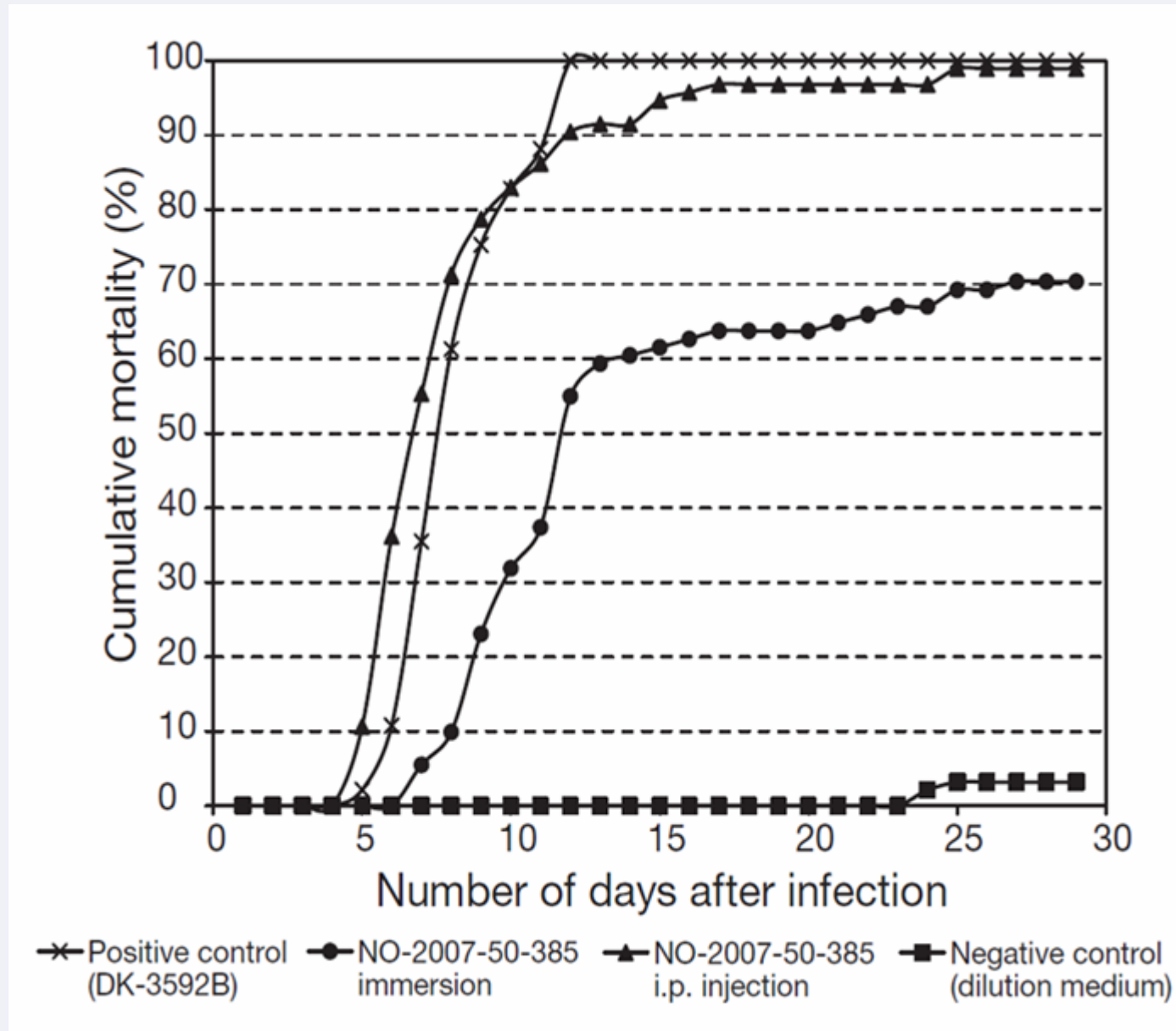


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Genotype II (n=7)



Fylogeni, N-genet



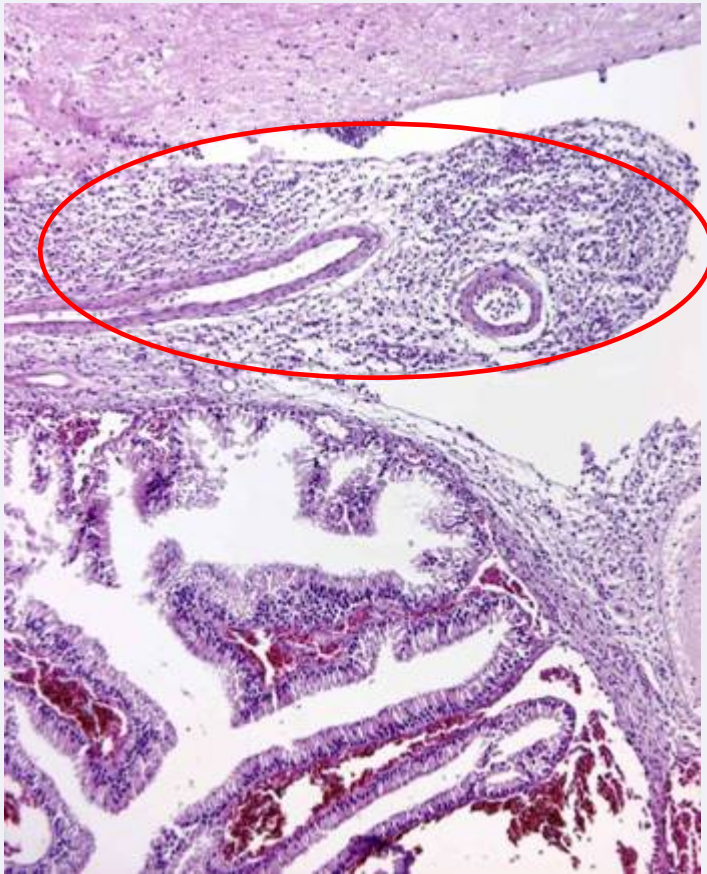
Pathogenicity

- Infectivity trial will only give limited information
- A negative trial does not always indicate avirules/low patogenicity
 - Infectious pancreatic necrosis virus (IPN)
 - Pancreas Disease Virus/Salmonid alphavirus (PDV)
- Histology and especially immunohistochemistry (IHC) can often provide information on patogenicity

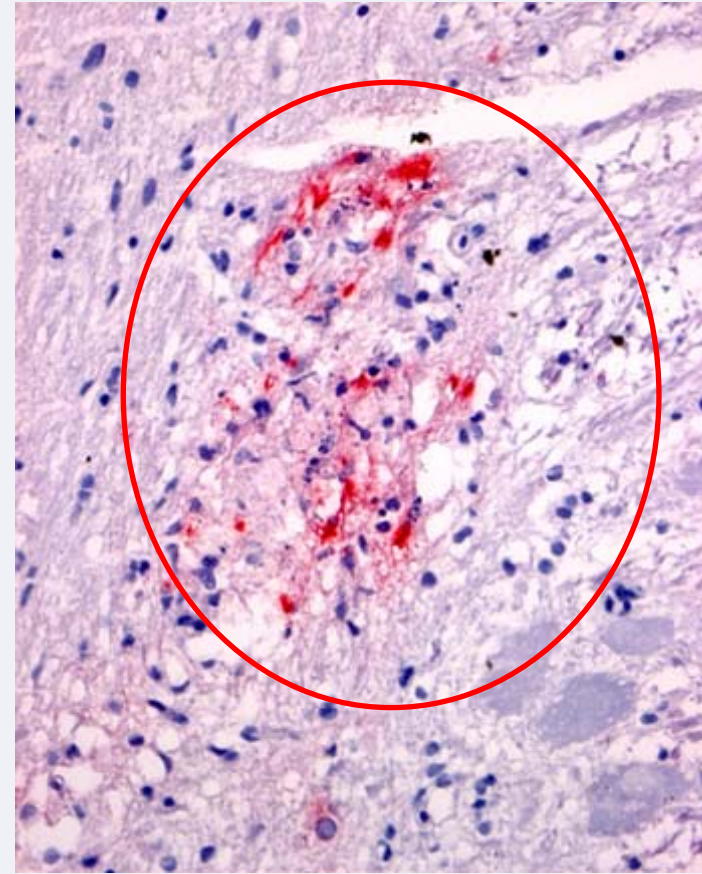


Viral Haemorrhagic Septicaemia (VHS)

Meningitis



Focal necrosis w/virus



Direct consequences

- The capacity of the pathogen to produce significant **disease** or mortality



Winter ulcer

Winter ulcer

One of the most serious disease problems in farming of salmonides

Associated with low water temperatures

Moderate mortality. Chronic disease

May result in low quality and down classing

Consequences:

Production losses

Fish welfare

Consumer reactions



Flavobacterium psychrophilum

- Bacterial cold water disease (BCWD)
- Rainbow trout fry syndrome (RTFS)
- Salmonides
- Well known disease problem in international aquaculture
- High mortality in fingerlings
- Can be vertically transmitted
- Difficult to eradicate in hatcheries



Flavobacterium

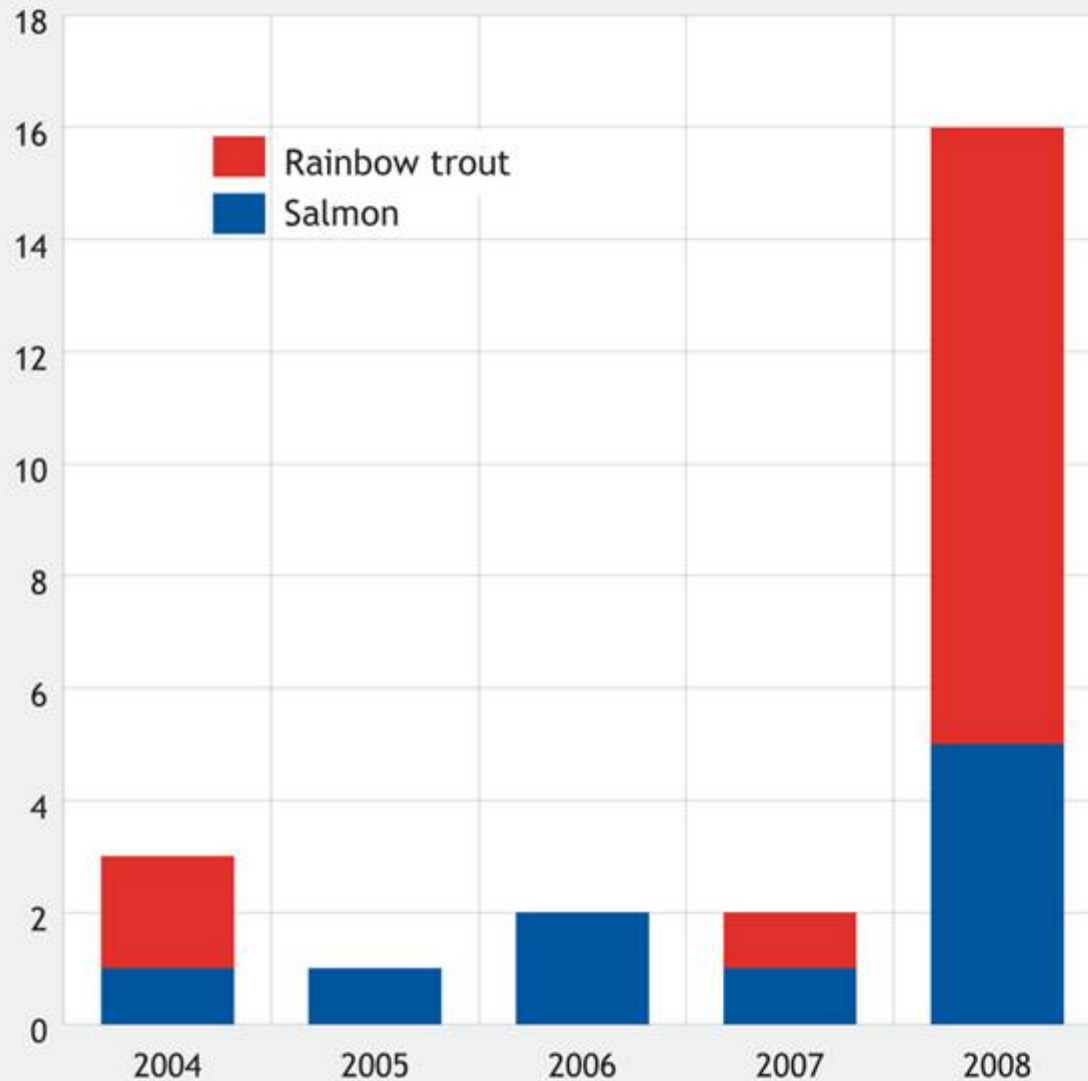


Figure 7. Total sites with *Flavobacterium psychrophilum* infection in rainbow trout and in Norway 2004-2008. All outbreaks in rainbow trout are systemic infections. In salmon all detections are related to ulceration and fin rot, with the exception of a single outbreak of systemic disease in 2008.



- Is this a hazardous disease?
- Is this disease widespread in Norway?
- Is this a new more virulent strain?

- Is there a risk of disease outbreaks in seawater?
- Can the disease be horizontally transmitted in brackish waters in some fjords?
- Can the disease be established in the brackish environment?

- Will this increase the use of antibiotics?
- Will this increase the likelihood of resistant strains?



Risk assessment and risk management

Politics

Ministry — Ministry — Ministry

Operative

Norwegian Food Safety Authority

Scientific

IMR — NIFES — NCRI — NVI — NIPH

VKM

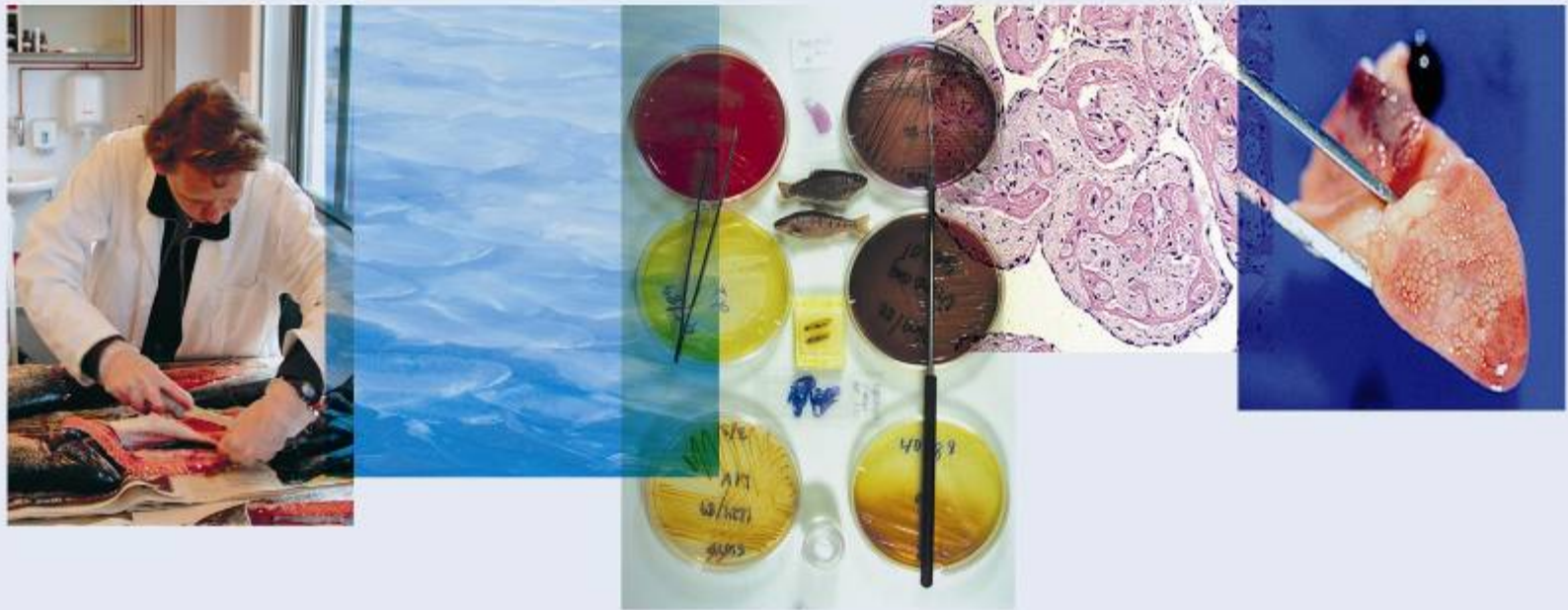


Communication

- “ This disease is not serious”
- “ ISA is not horizontally transmitted”
- “ Stamping out will be devastating for the local economy”
- “This disease is natural in the environment”

- Risk assessment is not always performed in quite and peaceful surroundings, but an open process where all stake holders can participate is especial.





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