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VIRTUAL COURSE

26 March to 15 April 2021

# Design of an Active Surveillance for Tilapia Lake Virus (TILV) Disease and Its Implementation

TCP/INT/3707: Strengthening biosecurity (policy and farm level) governance to deal with Tilapia lake virus



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CHECKLIST 5

1 April 2021

# Case/outbreak definition

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TCP/INT/3707: Strengthening biosecurity (policy and farm level) governance to deal with Tilapia lake virus



# Learning objectives

- To understand the requirements and criteria for Checklist 5
- To determine the most appropriate case definition for TiLV active surveillance



# Presentation topics

- International (OIE) requirements for aquatic diseases
- Definition of case
- Requirements
- Use of case definition
- Examples in several species and unit of interests



# The criteria for the inclusion of a disease in the OIE list are as follows:

1. **International spread** of the pathogenic agent (*via aquatic animals, aquatic animal products, vectors or fomites*) is likely.

AND

2. **At least one country may demonstrate country or zone freedom** from the *disease* in susceptible *aquatic animals*, based on provisions of Chapter 1.4.

AND

3. A precise **case definition** is available and a reliable means of detection and *diagnosis* exists.

AND ...



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# The criteria for the inclusion of a disease in the OIE list are as follows:

4.

a) Natural transmission to humans has been proven, and human infection is associated with severe consequences.

OR

b) The *disease* has been shown to affect the health of cultured *aquatic animals* at the level of a country or a *zone* resulting in significant consequences e.g. production losses, morbidity or mortality at a *zone* or country level.

OR

c) The *disease* has *aquatic animals* been shown to, or scientific evidence indicates that it would affect the health of wild resulting in significant consequences e.g. morbidity or mortality at a population level, reduced productivity or ecological impacts.



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# OLE list of Aquatic diseases

## SECTION 8.

- Chapter 8.1.
- Chapter 8.2.
- Chapter 8.3.

## SECTION 9.

- Chapter 9.1.
- Chapter 9.2.
- Chapter 9.3.
- Chapter 9.4.
- Chapter 9.5.
- Chapter 9.6.
- Chapter 9.7.
- Chapter 9.8.
- Chapter 9.9.

## SECTION 10.

- Chapter 10.1.
- Chapter 10.2.
- Chapter 10.3.
- Chapter 10.4.
- Chapter 10.5.
- Chapter 10.6.
- Chapter 10.7.
- Chapter 10.8.
- Chapter 10.9.
- Chapter 10.10.

## SECTION 11.

- Chapter 11.1.
- Chapter 11.2.
- Chapter 11.3.
- Chapter 11.4.
- Chapter 11.5.
- Chapter 11.6.
- Chapter 11.7.

## DISEASES OF AMPHIBIANS

- Infection with *Batrachochytrium dendrobatidis*
- Infection with *Batrachochytrium salamandrivorans*
- Infection with *Ranavirus* species

## DISEASES OF CRUSTACEANS

- Acute hepatopancreatic necrosis disease
- Infection with *Aphanomyces astaci* (Crayfish plague)
- Infection with *Hepatobacter penaei* (Necrotising hepatopancreatitis)
- Infection with infectious hypodermal and haematopoietic necrosis virus
- Infection with infectious myonecrosis virus
- Infection with *Macrobrachium rosenbergii* nodavirus (White tail disease)
- Infection with Taura syndrome virus
- Infection with white spot syndrome virus
- Infection with yellow head virus genotype 1

## DISEASES OF FISH

- Infection with epizootic haematopoietic necrosis virus
- Infection with *Aphanomyces invadans* (Epizootic ulcerative syndrome)
- Infection with *Gyrodactylus salaris*
- Infection with infectious salmon anaemia virus
- Infection with salmonid alphavirus
- Infection with infectious haematopoietic necrosis virus
- Infection with koi herpesvirus
- Infection with red sea bream iridovirus
- Infection with spring viraemia of carp virus
- Infection with viral haemorrhagic septicaemia virus

## DISEASES OF MOLLUSCS

- Infection with abalone herpesvirus
- Infection with *Bonamia exitiosa*
- Infection with *Bonamia ostreae*
- Infection with *Marteilia refringens*
- Infection with *Perkinsus marinus*
- Infection with *Perkinsus olseni*
- Infection with *Xenohaliotis californiensis*



# Purpose of case definition

- The purpose of a case definition is to assure that the surveillance will **focus on the disease of concern** and not any other disease showing similar clinical signs.
- Case/outbreak definition might include **clinical, laboratory** and **epidemiological** determinants of disease in consideration.
- On the other hand, strong consideration in making the case definition is to ensure sufficient surveillance system sensitivity (ability of the system to recognize disease in early stages of onset/introduction).





# Definition

- Agreed **set of rules** that permits investigators to uniformly decide that a particular individual has or does not have a particular disease
- It must be related with **study unit**
- It must account for status of **suspected and confirmed**
- Active surveillance for the specific disease include **all three requirements**
- **Syndromic surveillance** will rely only on a set of defined clinical symptoms



# Case/outbreak definition

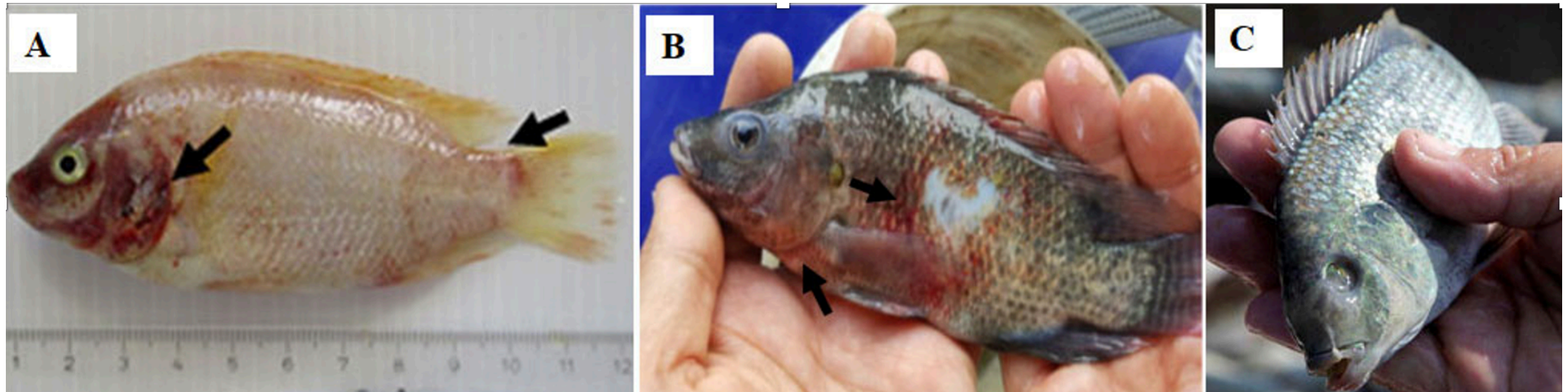
- Case/outbreak definition criteria include:
  - Clinical signs (disease syndrome)
  - Laboratory tests (Level I, II and III)
  - Epidemiological parameters (life stage, temperature..)
  - Other parameters, if scientifically confirmed
- Clear and unambiguous case definitions and outbreak definitions should be developed and documented for each disease under surveillance, using, where they exist, the standards from the OIE Aquatic Manual (if exist) or peer review scientific literature and expert opinions.



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# Case definition: clinical criteria

- Clinical and sub clinical
- Comorbidities
- Moribund and lethal sampling
- Access to moribund/dead fish during inspection and surveillance



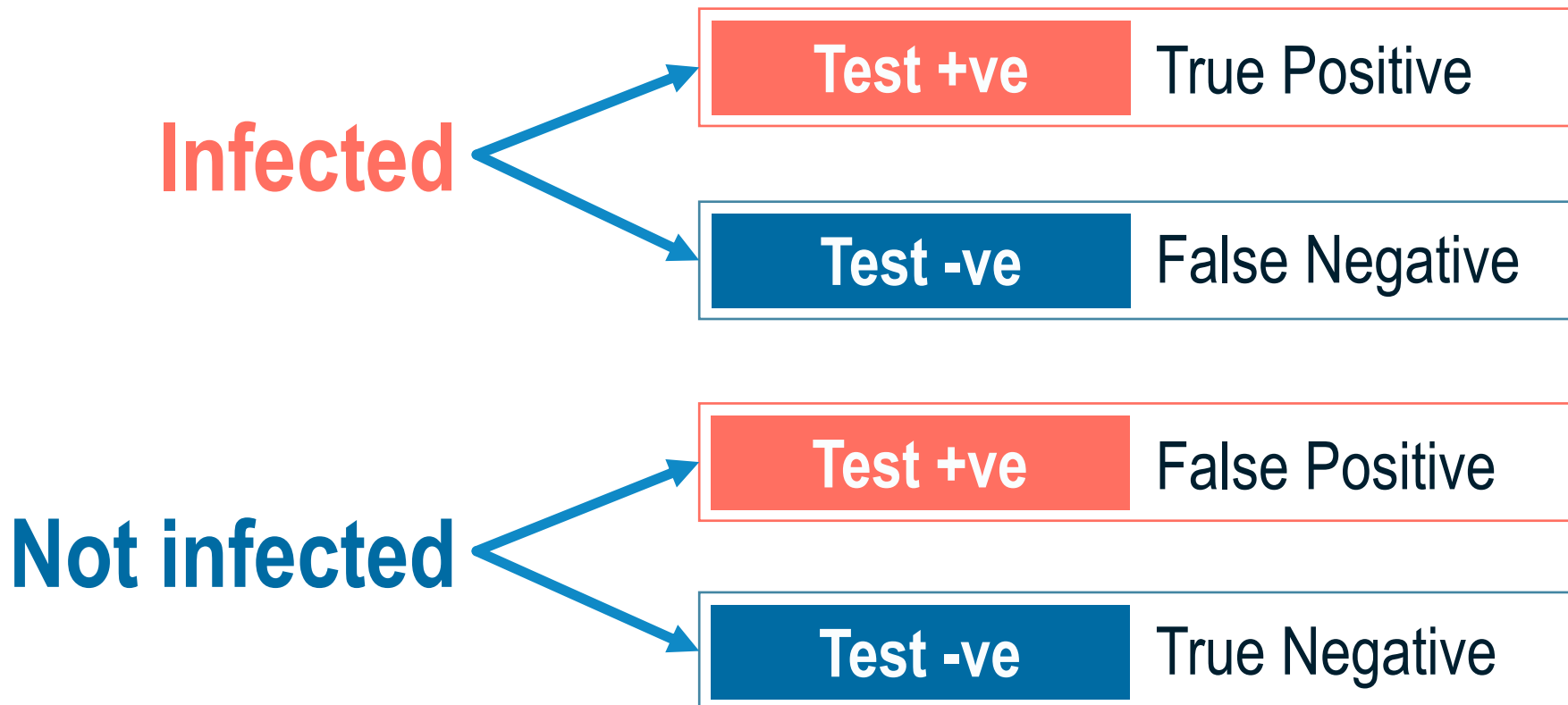
Gross signs of TiLV disease in clinical samples. **(A) diseased red tilapia showed hemorrhage (black arrows)**, photo credit: © 2017. Elsevier B.V. a derivative of figures by Tattiyapong *et al.*, 2017. *Veterinary Microbiology*; **(B) diseased Nile tilapia showed skin erosion, hemorrhage on various parts of body, loss of scales, abdominal swelling, and protruding eyeball (exophthalmos)**; photo credit: Natan Wajsbrod; **(C) diseased wild tilapia (*Sarotherodon galilaeus*) showed shrinkage of the eye and loss of ocular functioning (phthisis bulbi)**, photo credits: © 2014. American Society of Microbiology, a derivative of figures by Eyngor *et al.*, 2014. *Journal of Clinical Microbiology*.



# Case definition (laboratory criteria)

- Defined level I, II and III diagnostic
- Accounting for analytical sensitivity and specificity of dg test
  - **Sn** limit of detection for a disease agent
  - **Sp** ability to distinguish the targeted disease agent from another
- Accounting for diagnostic (epidemiological) sensitivity and specificity of dg test
  - **Sn** Probability of test to correctly identify diseased individuals
  - **Sp** probability of test to correctly identify non diseased individuals

# Binary test output – no/yes; 0/1





# Sensitivity and specificity of diagnostic test

	TRUE DISEASE STATUS		
	D+	D-	
Test +			
Test -			

# Sensitivity and specificity



**Sensitivity (Se):** probability of testing positive if truly infected

**Specificity (Sp):** probability of testing negative if truly non-infected



# Case definition (epidemiological criteria)

- Expected prevalence and incidence figures
- Expected morbidity and mortality figures
- Exposure and risk information





## Example: case definition of EUS

- **Clinical:** Fish usually develop red spots or small to large ulcerative lesions on the body; the early signs of disease include loss of appetite and fish become darker. Infected fish may float near the surface of the water, and become hyperactive with a very jerky pattern of movement.
- **Laboratory:** *Aphanomyces invadans* confirmed with Level I, II and III
- **Epidemiological:** (using existing and scientifically validated information on disease pattern such as: disease prevalence, transmission mechanisms, geographical distribution, mortality and morbidity, environmental factors i.e. temperature- occurs mostly at water temperature of 18 – 22 C and after period of heavy rainfall)



# Importance of case definition in surveillance

- Secure confidence in surveillance
- Ensure sufficient surveillance program sensitivity
- Contribute to cost effectiveness of surveillance program
- Contribute to transparency of reporting system and confidence of trading partners



# Case/outbreak definition: TiLV

- TiLV is not OIE listed aquatic disease, so for purpose of surveillance following model might be used:
- **(suspected)** A tilapia farming system in which the farmer has observed during the previous and ongoing production cycles sudden mortalities and/or clinical signs such as skin redness/erosion or eyes protrusion/ruptured/cloudiness or abdomen swollen or scale protrusion/loss, attributable to the presence of TiLV (e.g. farmer answer “yes” to the question whether TiLV has occurred or not in the farm of interest).
- **(confirmed)** Upon the collection of 30 moribund or sick fish samples, TiLV is confirmed by a positive test result using PCR and the detection of histopathological signs of TiLV.



# Homework

To define case/outbreak definition for TiLV surveillance  
in regards with:

- Epidemiological unit
- Suspect and confirmed status
- Clinical, laboratory and epidemiological criteria



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# Thank you for your attention!

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**TCP/INT/3707:**

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Norad