



Food and Agriculture
Organization of the
United Nations



FAO/China Intensive Training Course on Tilapia Lake Virus (TiLV)

Sun Yat Sen University, Guangzhou, China

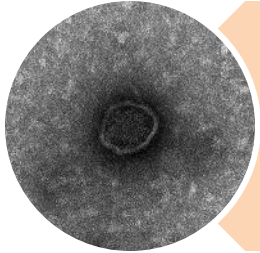
18-24 June 2018

Session 5

Win Surachetpong DVM, PhD, CertAqV, DTBVP

Farm-level biosecurity (TiLVD prevention and management)

Outlines:



What is biosecurity?



Identify risks causing the introduction and spread of disease



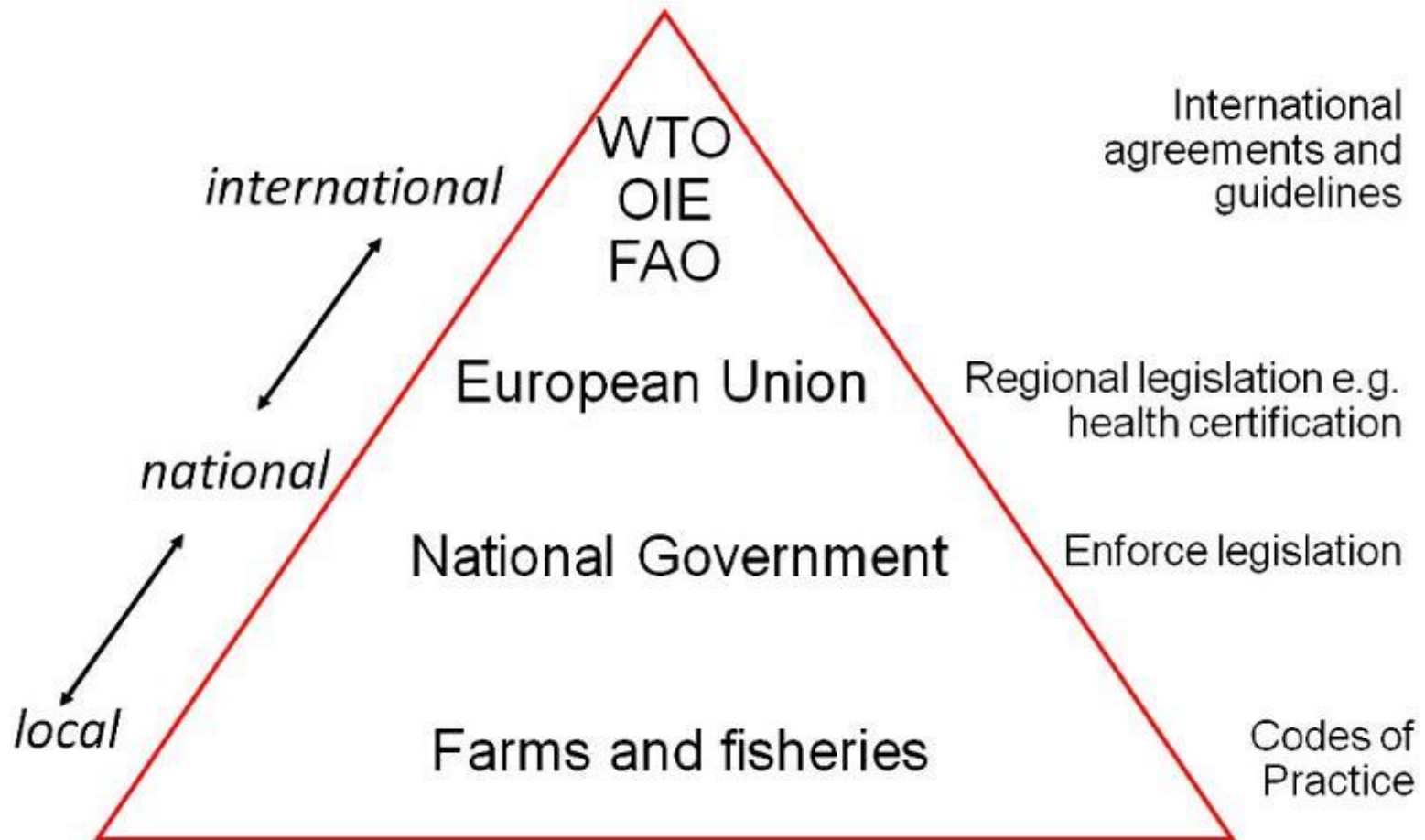
Implement mitigating measures to control the threat

Biosecurity

A set of management and physical measures designed to reduce the risk of introduction, establishment and spread of pathogenic agents to, from and within an aquatic animal population

OIE aquatic animal health code, 2015

The biosecurity pyramid



Oidtman et al., 2011. Aquaculture

Biosecurity plan

An effective biosecurity plan should describe in detail:

- 1. Potential pathways for introduction and spread into the compartment of the agents**
- 2. Critical control points for each pathway**
- 3. Measures to mitigate exposure for each control point**
- 4. Standard operating procedures including:**
 - Implementation, maintenance, monitoring of compliance with the risk mitigation measures**
 - Application of corrective actions**
 - Verification of the process**
 - Record keeping**

OIE aquatic animal health code, 2017

Biosecurity plan

An effective biosecurity plan should describe in detail:

- 5. Contingency plan in the event of a change in the level of exposure**
- 6. Report procedures to authorities**
- 7. Worker training and education programs**
- 8. Surveillance program in place**

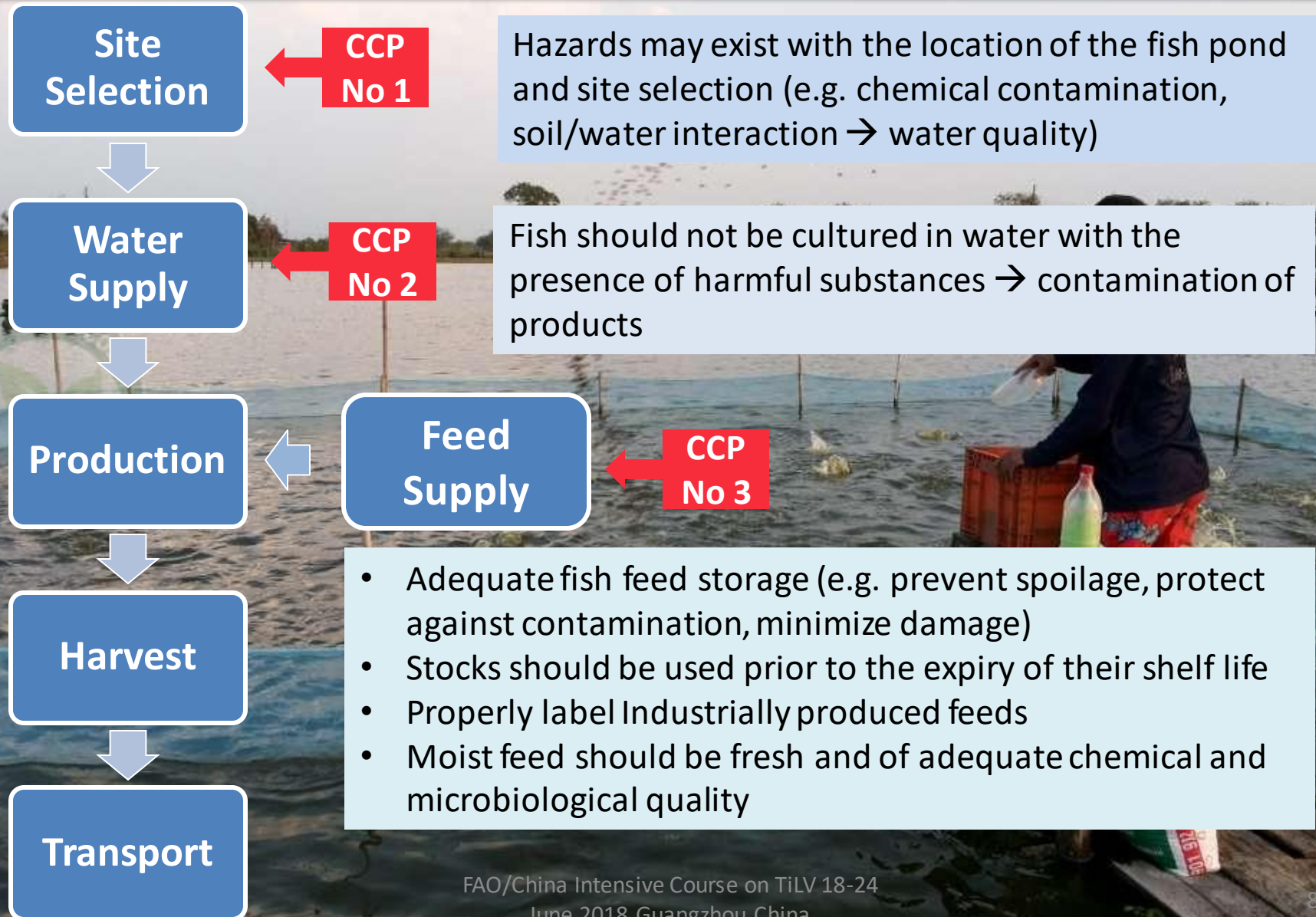
1. Potential pathways for introduction and spread into the compartment of the agents



Open cage culture: risk of diseases
Open environment → pathogens

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2. Critical control points for each pathway



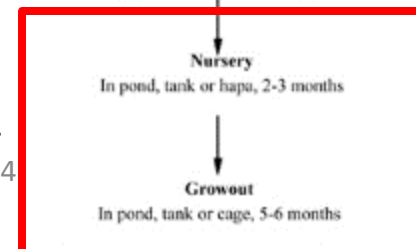
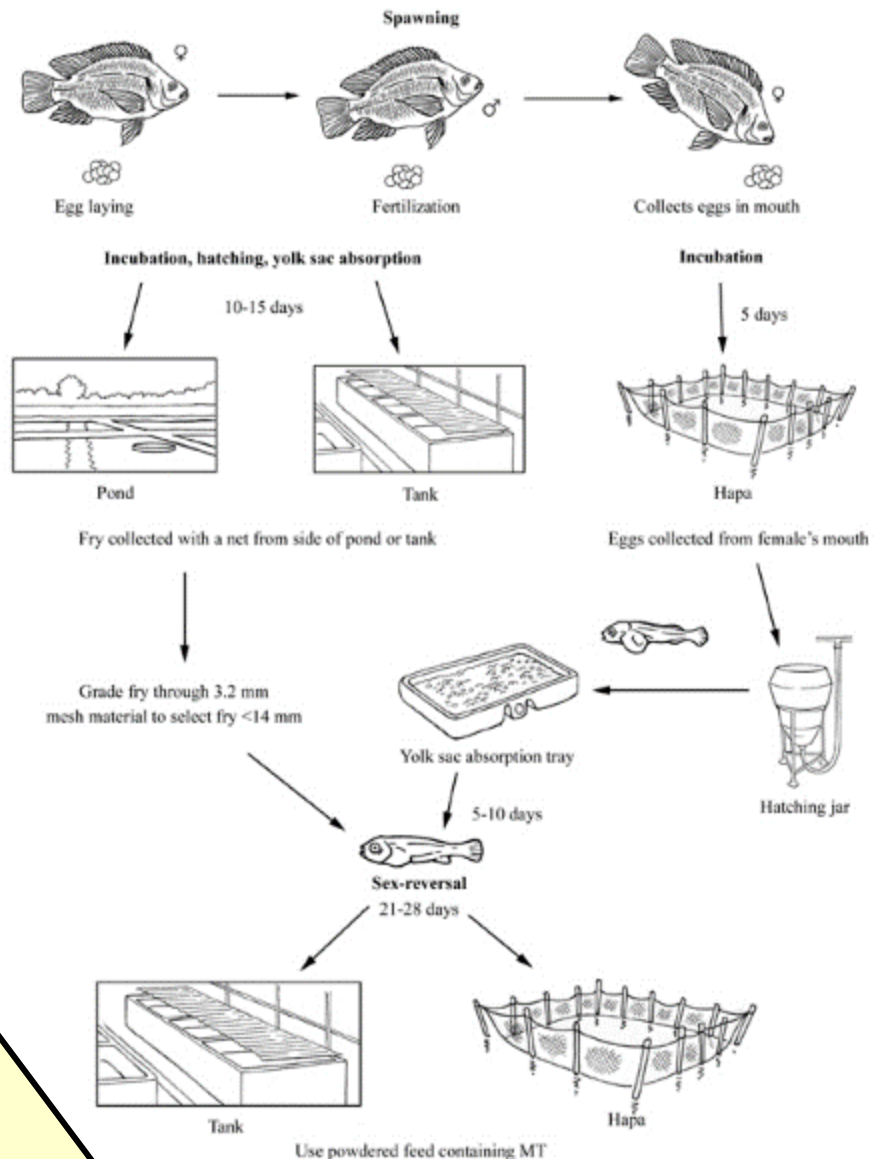
2. Critical control points for each pathway

Tilapia production cycle
Fish transfer to growout pond

Nursery
(in ponds, tanks, hapas)
2-3 months

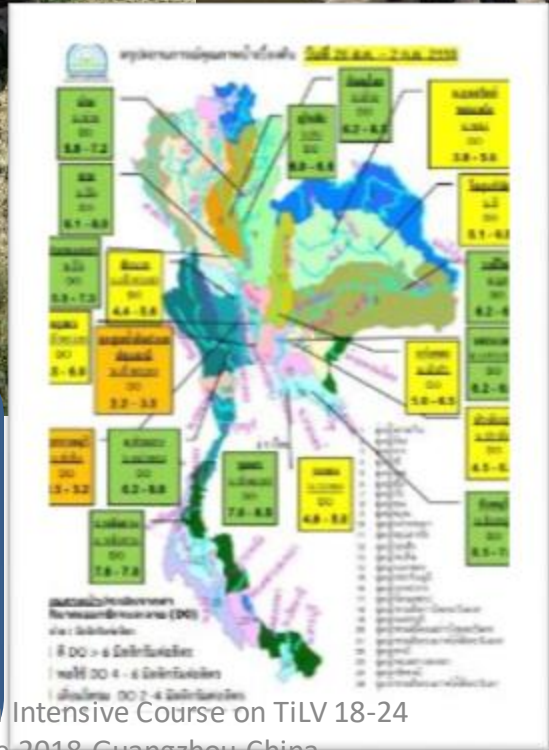
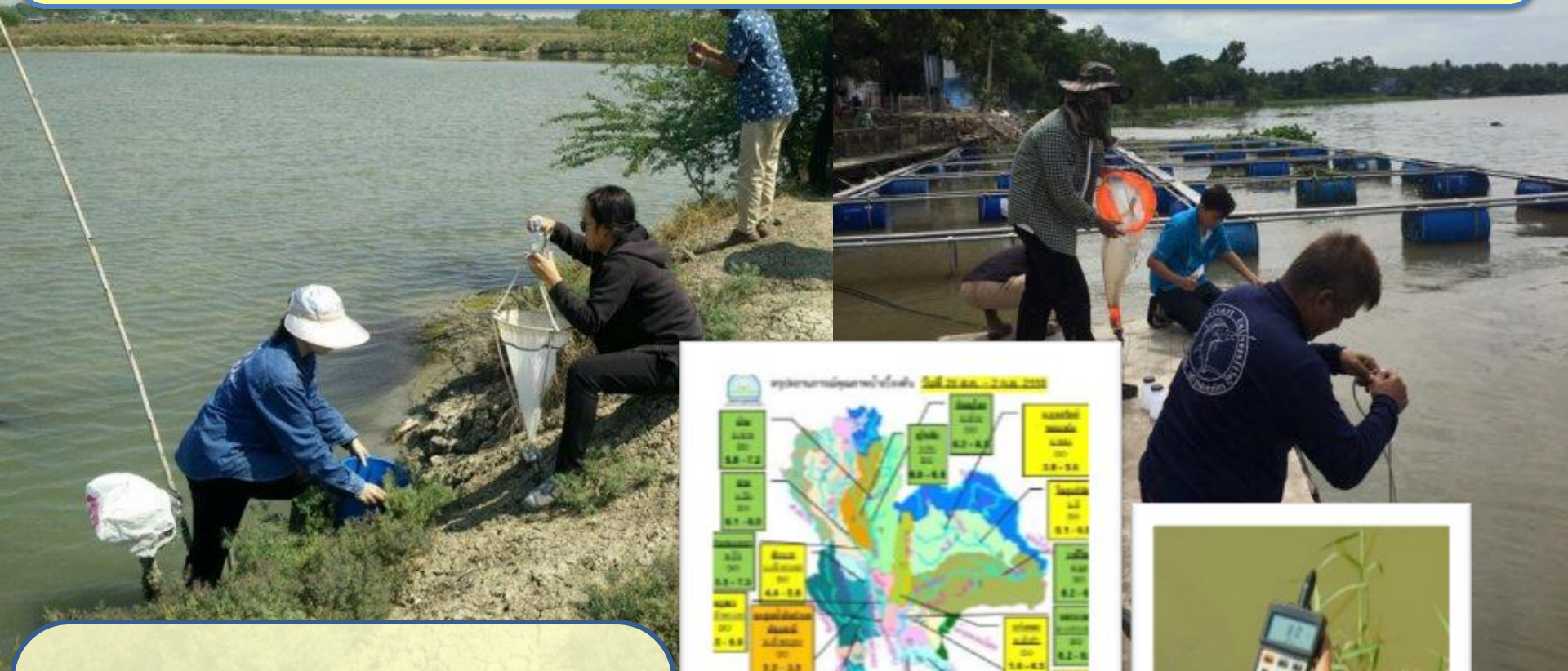


Growout
(in ponds, tanks, cages)
5-6 months



FAO, 2018

3. Measures to mitigate exposure for each control point



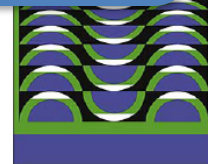
Water quality Sampling and monitoring

3. Measures to mitigate exposure for each control point



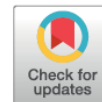
Aquaculture

journal homepage: www.elsevier.com/locate/aquaculture

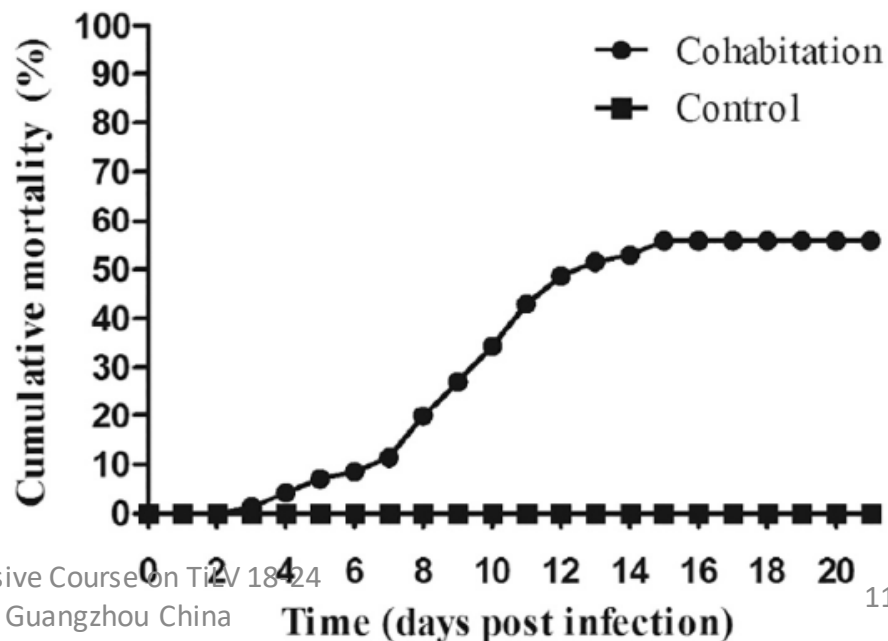
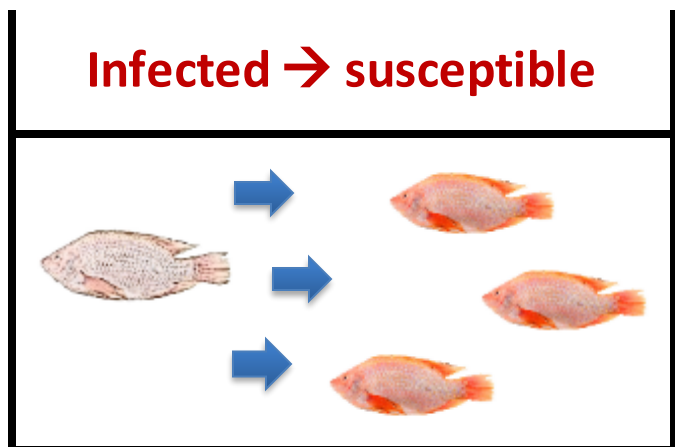


Horizontal transmission of TiLV via fish mucus

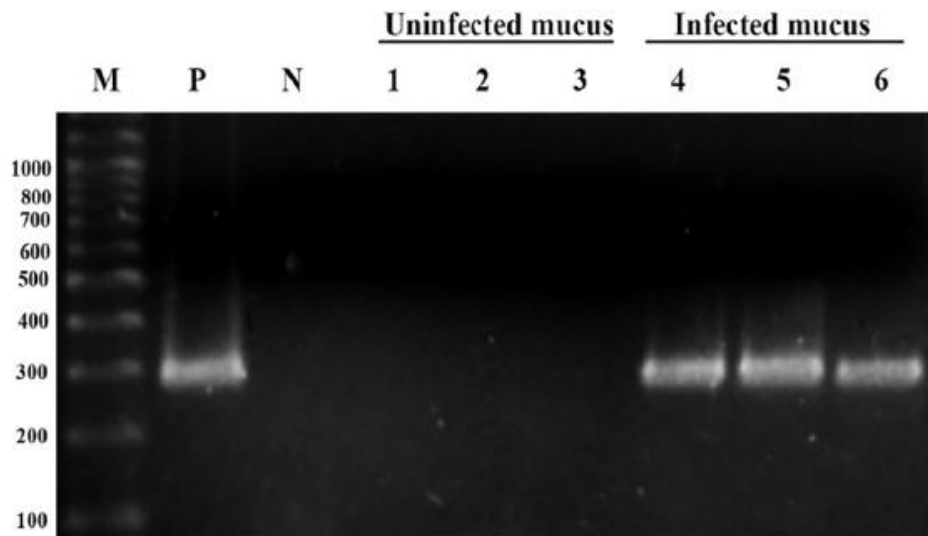
Non-lethal sampling for Tilapia Lake Virus detection by RT-qPCR and cell culture



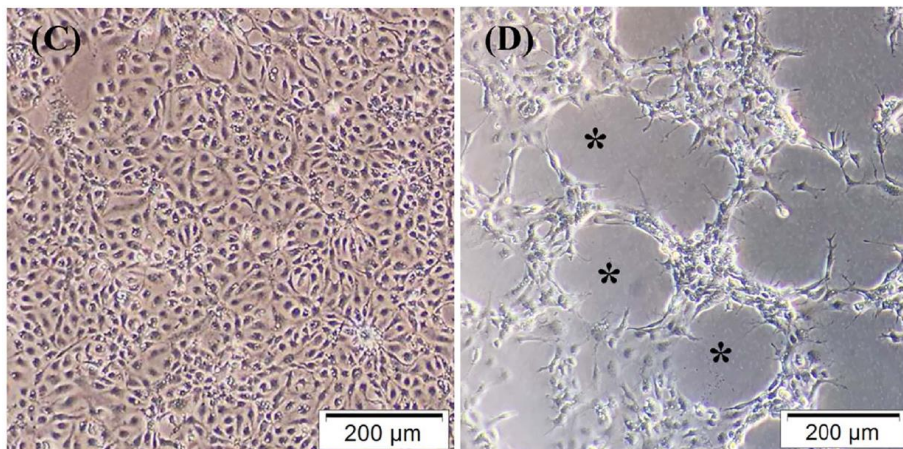
Pavarit Liamnimitr^a, Worryanee Thammatorn^a, Sonicha U-thoomporn^a, Puntanat Tattiyapong^b, Win Surachetpong^{a,b,*}



3. Measures to mitigate exposure for each control point



- **Detection of TiLV in infected tilapia mucus**

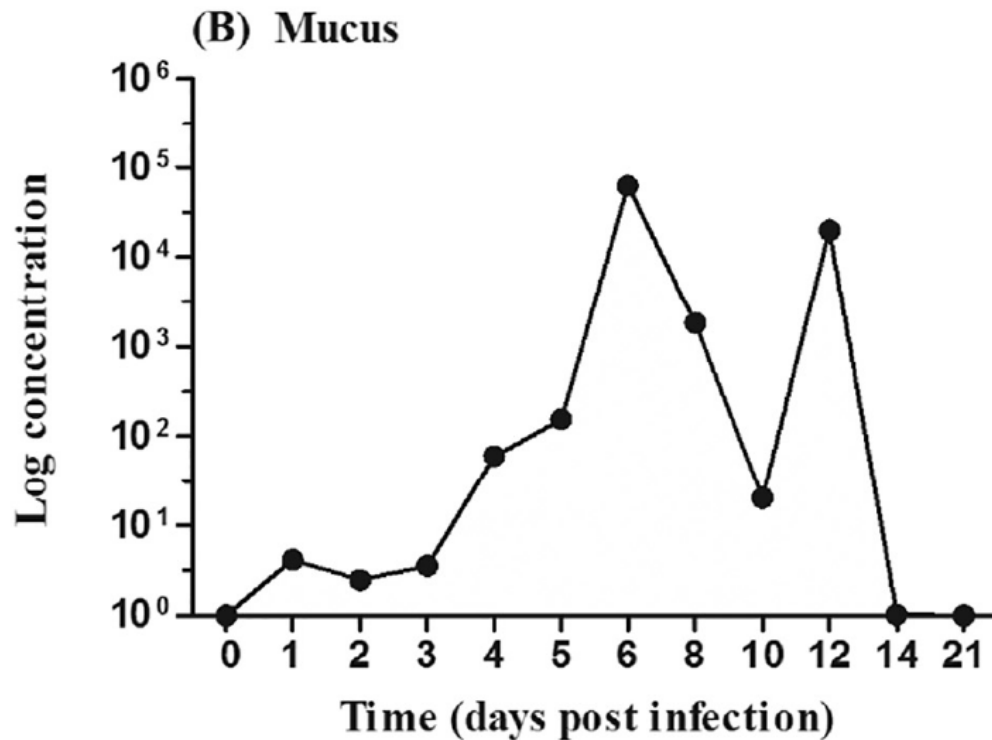


- **Virus in mucus is still infective!**

3. Measures to mitigate exposure for each control point

TiLV present in mucus up to 12 dpi → shedding

- Management of dead fish is critical



3. Measures to mitigate exposure for each control point

Some solutions

“The quicker you remove dead fish, the less impact on disease transmission”



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4. Standard operating procedures

Aquaculture



Standard Operating Procedures

Fish Health Management for Recirculating Aquaculture

TASK FREQUENCY

Monitoring fish behavior	Continuous
Minimizing stress	Continuous
Identifying disease issues	Daily
Controlling disease	As needed
Fish health sampling	As needed

✓ Do → Aeration → improve DO

DO from 4.5 to 6.5



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✓ Do → Reduce stress e.g. Handling



Slide courtesy: Dr. Prakarn Chiarakhongman

Don't use dead tilapia to feed other fish



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5. Contingency plan in the event of a change in the level of exposure

TROUBLESHOOTING ACTION PLAN

Fish exhibit erratic swimming behavior	<ol style="list-style-type: none"> 1. Observe and record fish behavior 2. Collect a sick fish sample 3. Contact operations manager and aquatic veterinarian 4. Perform water quality analysis 5. Perform water exchange in the affected culture unit
Fish float upside down	<ol style="list-style-type: none"> 1. Observe and record fish behavior 2. Collect a sick fish sample 3. Contact operations manager and aquatic veterinarian 4. Remove all dead fish 5. Perform water quality analysis 6. Perform water exchange (if necessary)
Fish gulping for air at surface	<ol style="list-style-type: none"> 1. Aerate water 2. Contact operations manager and aquatic veterinarian 3. See also, "Fish have brown gills" 4. Perform water quality analysis 5. Perform water exchange (if necessary)
Fish have lesions on body	<ol style="list-style-type: none"> 1. Observe and record fish behavior 2. Collect a sick fish sample 3. Contact operations manager and aquatic veterinarian 4. Apply prescribed therapeutants or aquaculture drugs 5. Aerate water 6. Perform water quality analysis 7. Perform water exchange

Contingency Plan Template for On-Farm Planning

The Canada-British Columbia
Environmental Farm Plan Program

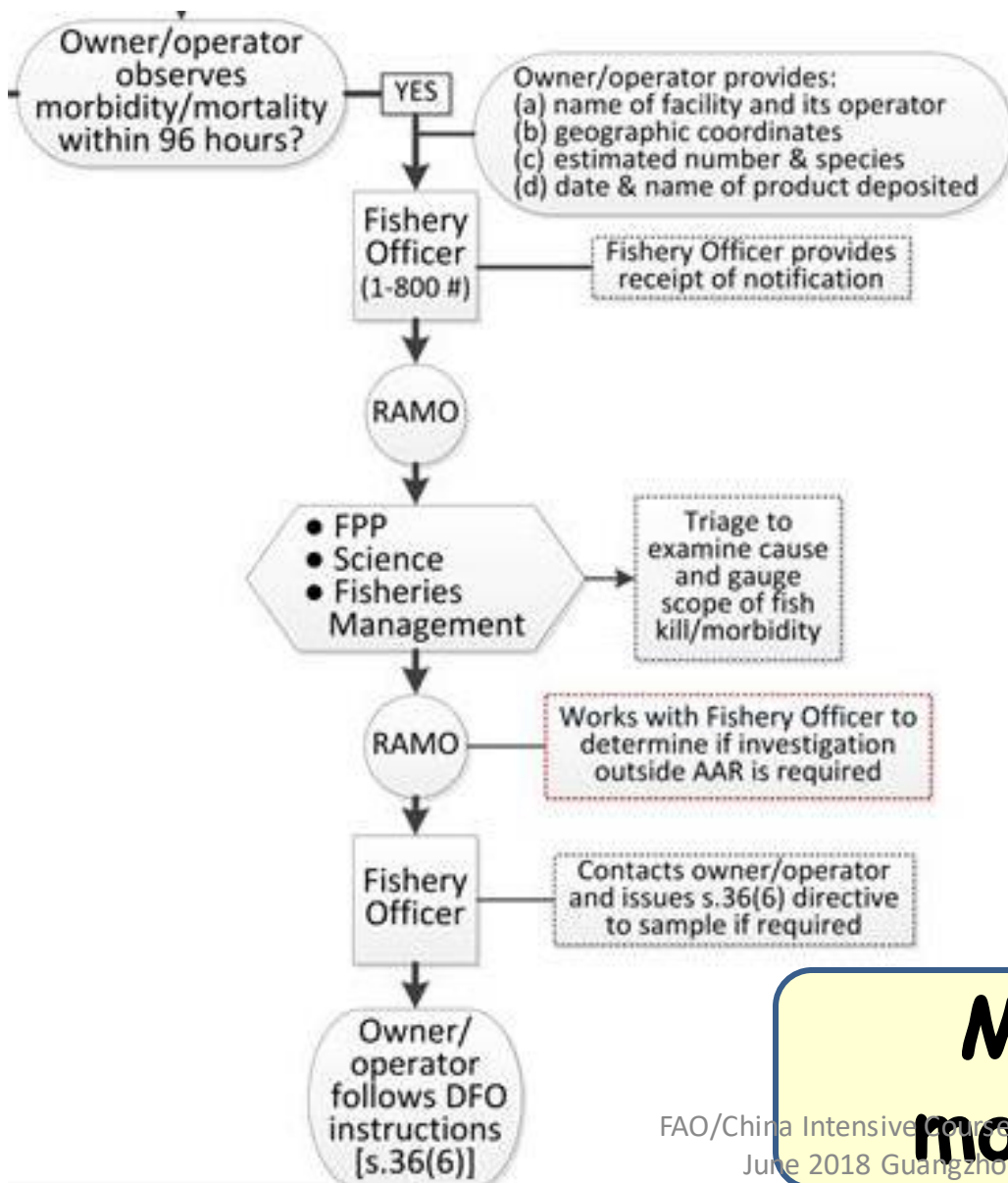
Order No. 390.100-0
September 2007

prepared to assist with completing an on-farm contingency plan to protection using the *Canada – British Columbia Environmental Farm Plan Handbook and Reference Guide*.

to assist you in completing your own contingency plan, using relevant additional items relevant to your farm.

it can be easily seen or found (in case it is needed while you are away usually (or after an incident or any significant change in farm operations). family, employees and where appropriate with neighbouring farms.

6. Report procedures to authorities



แบบฟอร์มเจ้าตรวจประเมินสุขอนามัยฟาร์มเพื่อการส่งออก

วันที่.....เดือน.....พ.ศ.....

เจ้าพนักงานที่ตรวจประเมินสถานประกอบการ

ชื่อ.....ตำแหน่ง.....หน่วยงาน.....
 ชื่อ.....ตำแหน่ง.....หน่วยงาน.....

เจ้าตรวจสถานประกอบการชื่อ.....
 ตั้งอยู่เลขที่.....หมู่ที่.....ถนน.....ตำบล/แขวง.....
 อำเภอ/เขต.....จังหวัด.....รหัสไปรษณีย์.....
 เลขหมายโทรศัพท์.....เลขหมายโทรสาร.....

ชื่อ-ที่อยู่ในการจัดส่งเอกสาร ที่อยู่สถานประกอบการ อื่นๆ (ระบุ).....
 เลขที่.....หมู่ที่.....ถนน.....ตำบล/แขวง.....
 อำเภอ/เขต.....จังหวัด.....รหัสไปรษณีย์.....
 เลขหมายโทรศัพท์.....เลขหมายโทรสาร.....

เลขที่ทะเบียนฟาร์ม ๑. ทะเบียนสถานประกอบการส่งออกสัตว์น้ำ ส.๑ TH.....
 ขอนำเข้าการรับรองสัตว์น้ำ.....
 ๒. ทะเบียนสถานประกอบการส่งออกสัตว์น้ำ ส.๒ TH.....
 ขอนำเข้าการรับรองสัตว์น้ำ.....

ชนิดสัตว์น้ำที่ส่งตัวอย่าง

๑.....	จำนวน.....ตัว	๒.....	จำนวน.....ตัว
๓.....	จำนวน.....ตัว	๔.....	จำนวน.....ตัว
๕.....	จำนวน.....ตัว	๖.....	จำนวน.....ตัว

ชื่อคิดเห็นเจ้าพนักงานที่.....

เจ้าของสถานประกอบการ/ผู้แทน..... เจ้าพนักงานที่.....
 รับผิดชอบ.....

Morbidity and mortality report

7. Worker training and education programs



SmartFish
Working Papers

No 001

Fish Handling, Quality and Processing :
Training and Community Trainers
Manual



Prepared by

Ansen Ward

Yolaine Beyens

FAO/China Intensive Course on TiLV 18-24
June 2018 Guangzhou China



Funded by
European Union

PERSONAL HYGIENE 1. GOOD PRACTICES

WASH HANDS BEFORE WORKING
AND AFTER TOILET



GOOD PERSONAL HYGIENE STOPS US
PASSING BACTERIA AND DIRT ONTO THE
FISH



COVER WOUNDS OR CUTS



NO SMOKING OR SPITTING!

8. Surveillance program in place



Guidance on disease control and biosecurity provided by OIE standards

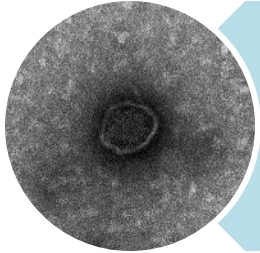
- **Pathogen characteristics, epidemiology, control, and prevention**
- **Sampling of animals for diagnostic purposes**
- **Diagnostic methods (to demonstrate freedom from infection and in disease outbreaks)**

Oidtmann et al., 2011. Aquaculture

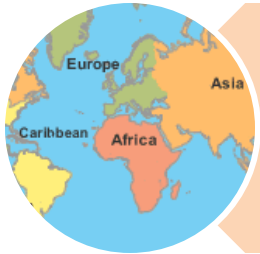
Important concerns regarding biosecurity

- **Movement of live fish and products**
- **Distance between farms**
- **Mechanical transmission**
- **Biosecurity practices**

Outlines:



What is biosecurity?



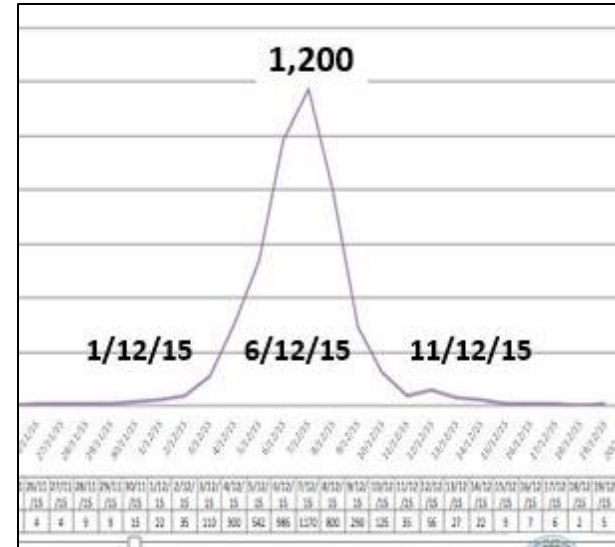
Identify risks causing the introduction and spread of disease



Implement mitigating measures to control the threat

How do we know if TiLV exists in a farm?

- High mortality **20-90%**
- Swimming at the water surface
- Skin redness, erosion
- Red tilapia → pale body
- Exophthalmos, scale protrusion



Swimming at the water surface, pale color



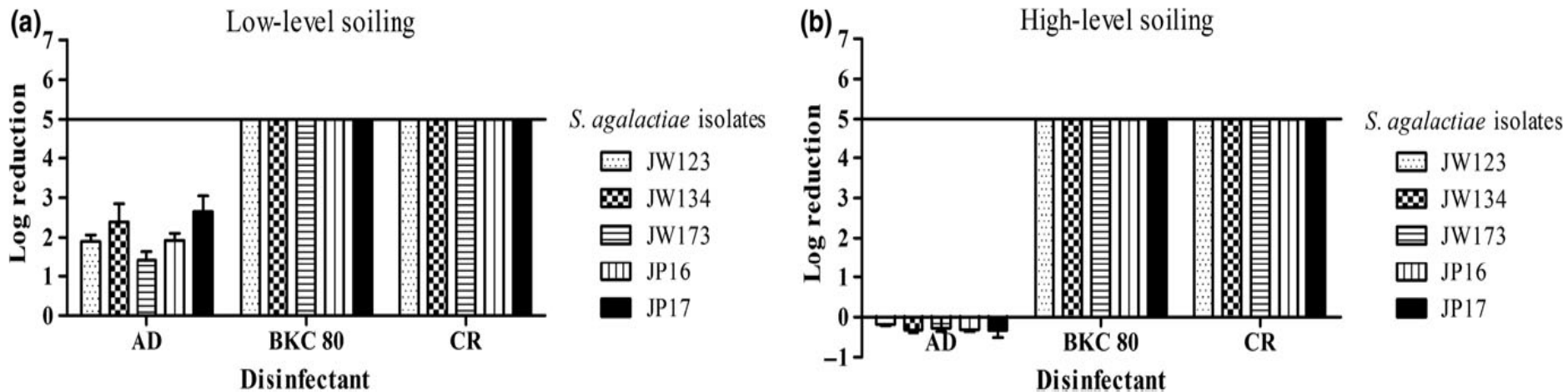
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Biosecurity - key considerations for TiLV control

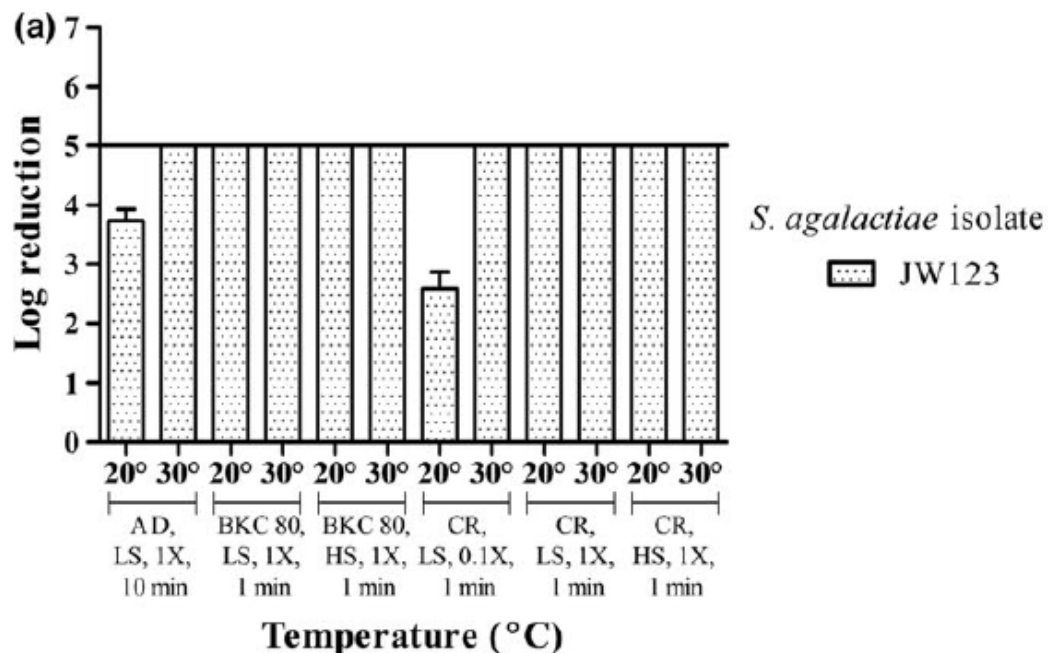
- Fish movement (**between sites**)
- Personnel (**control facility access**)
- Trucks, equipment, boats (**disinfectants**)
- Sick and dead fish management (**quickly remove them**)
- Potential vectors (**???**)

Roles of water quality and disinfectant application on inactivation of fish pathogenic *Streptococcus agalactiae* with povidone iodine, quaternary ammonium compounds and glutaraldehyde

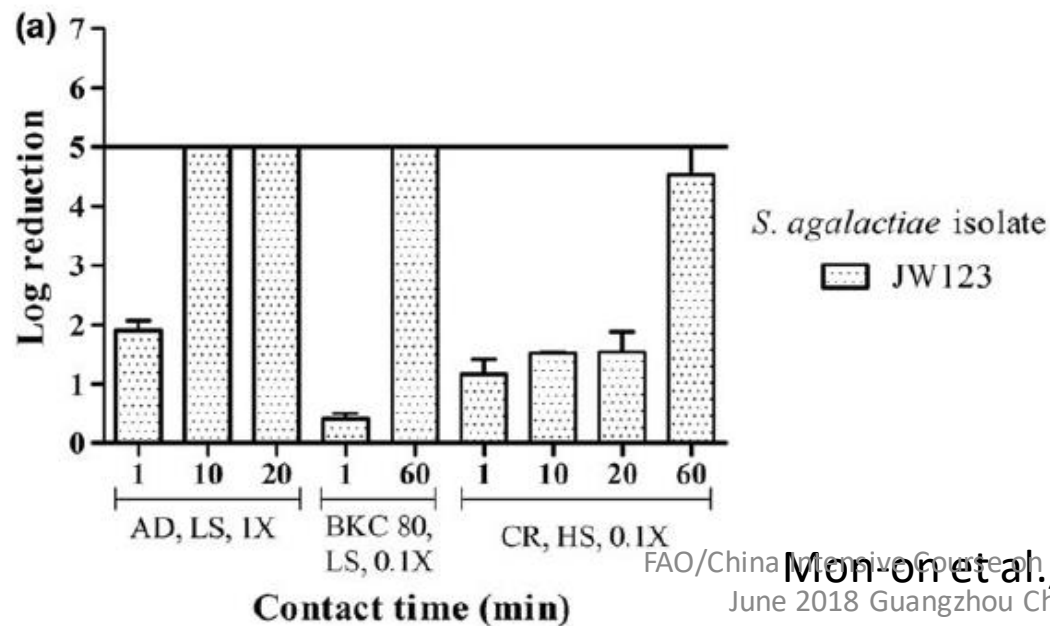
N Mon-on¹ | W Surachetpong¹  | S Mongkolsuk^{2,3} | K Sirikanchana^{2,3}



- QAC and glutaraldehyde: the most effective disinfectants



- **Temperature (20°C)** affects disinfectant efficacy



- **Contact time** affects disinfectant efficacy

Pond culture with environment control

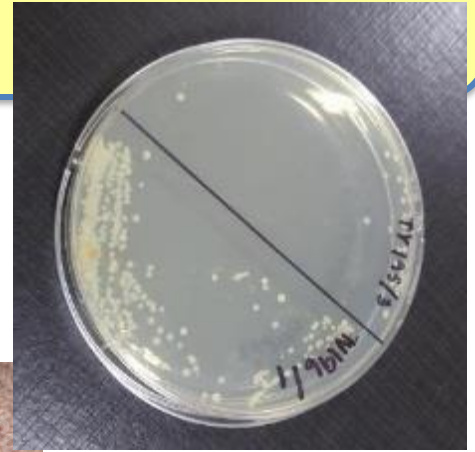


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Central Thailand; TiLV negative farm

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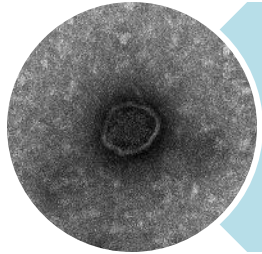
Don't forget... the problem is more complicated than you think



**Flavobacterium, Aeromonas,
Streptococcus, Francisella**

**Multiple bacteria +
parasites + virus**

Outlines:



What is biosecurity?

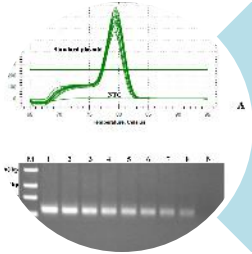


Identify risks causing the introduction and spread of disease



Implement mitigating measures to control the threat

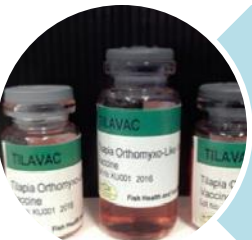
Biosecurity and management of TiLV



Active surveillance, disease screening, and containment



Biosecurity and farm management



Vaccine development

Pathogen and disease surveillance

1. Internal surveillance
 - Active surveillance
 - Collection and analysis of disease/infection data
 - Ensure early detection of pathogenic agents
2. External surveillance
 - Targeted and passive surveillance
 - Help identify changes to the level of exposure in pathways

(OIE - Aquatic Animal Health Code)

Pathogen and disease surveillance



Disinfection

- Disinfecting cage nets



(OIE - Aquatic Animal Health Code)

TILAVAC: Vaccine for the prevention of an emerging viral disease in tilapia

KU Innovation Award (1st prize) 2016



Lab and field testing of vaccine performance

- Survival of vaccinated groups higher than the control group
- Live and killed vaccines
- Currently testing in the field, under natural infection conditions



Live vaccine against TiLV

- **KOVAX, Israel**

NEW – We developed a vaccine to against the TLV (TiLV) disease that was identified as the cause to mortalities in Egypt, Thailand, Ecuador, Colombia, Taiwan and Israel Farms.



Thank you