UTF/077/ZAM: Technical Assistance to the Zambia Aquaculture Enterprise Development Project (ZAEDP)

Session 3:
Introduction to Tilapia Lake Virus (TiLV)

Win Surachetpong

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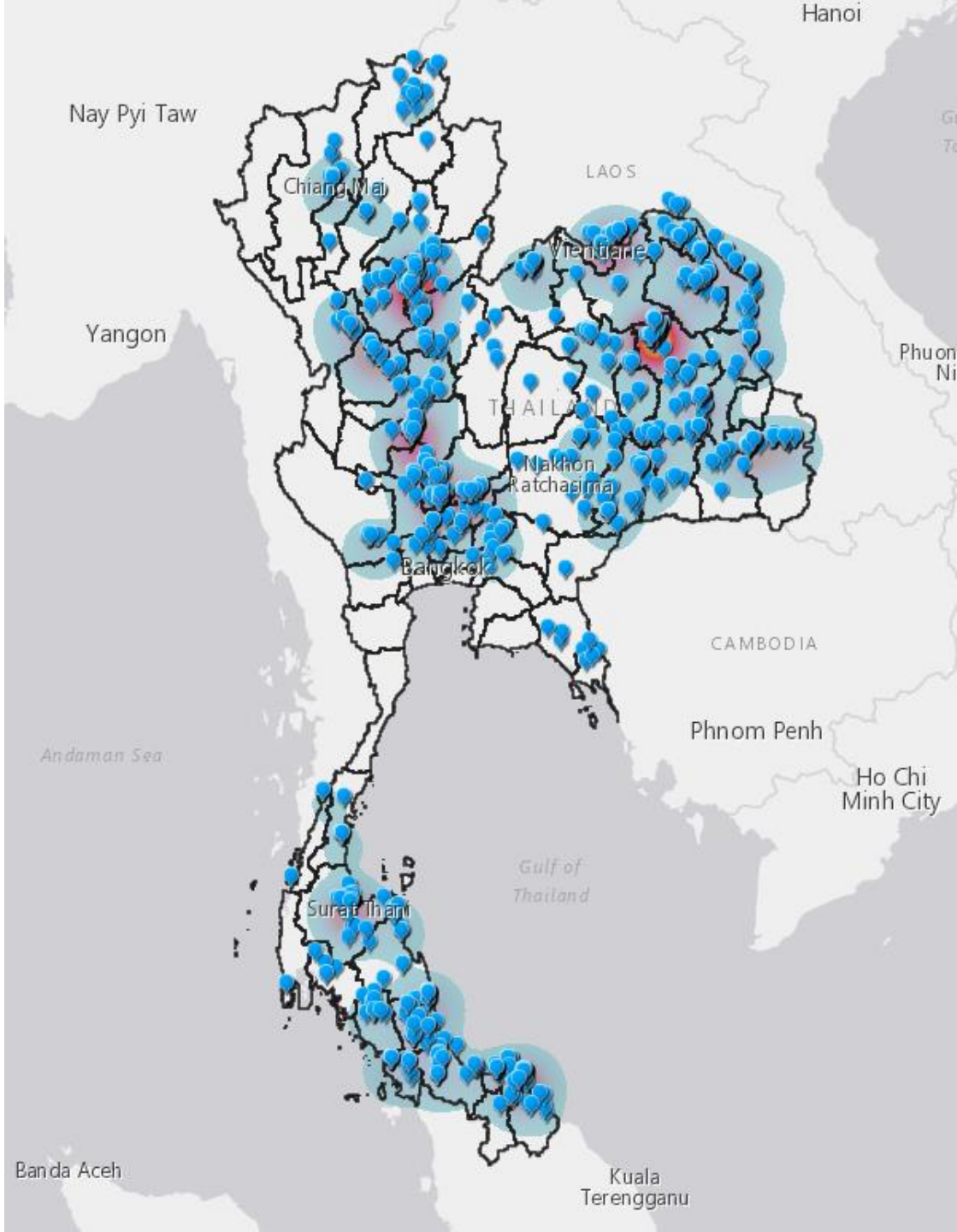
Red hybrid tilapia
(*Oreochromis* spp.)

Nile tilapia
(*Oreochromis niloticus*)


Hanoi
Nay Pyi Taw
LAOS
Chiang Mai
Vientiane
Yangon
THAILAND
Nakhon Ratchasima
Bangkok
CAMBODIA
Phnom Penh
Andaman Sea
Ho Chi Minh City
Gulf of Thailand
Surat Thani
Banda Aceh
Kuala Terengganu

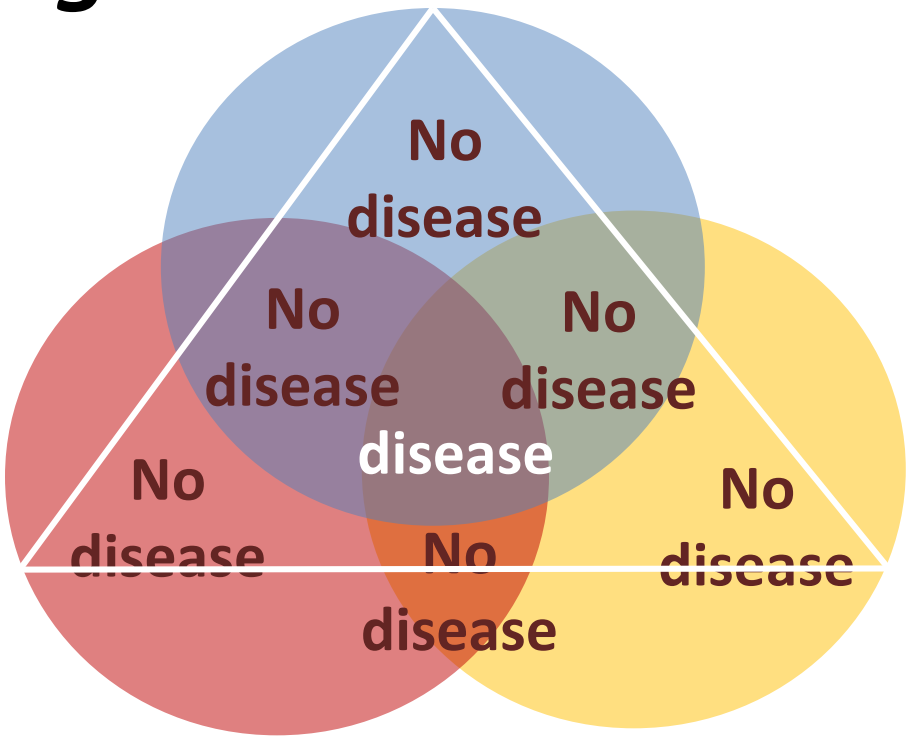
Open cage culture: risk of diseases

TILAPIA HEALTH & DISEASES

Requirements for diseases:

The disease triangle

Susceptible host



Pathogen

Favourable environment

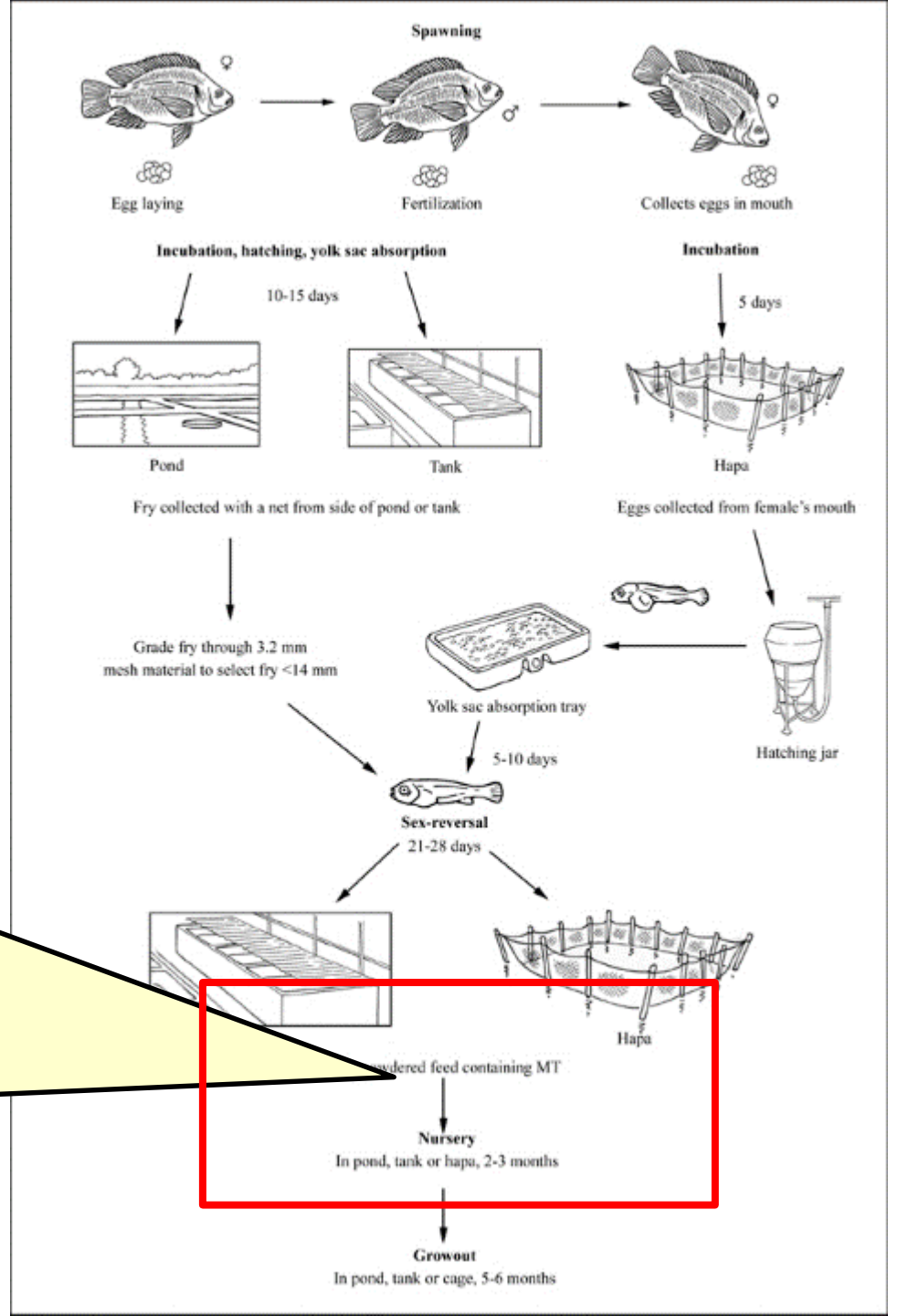
Outbreaks require all these 3 factors

Critical points

Tilapia production cycle
Fish transfer to grow out pond

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

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



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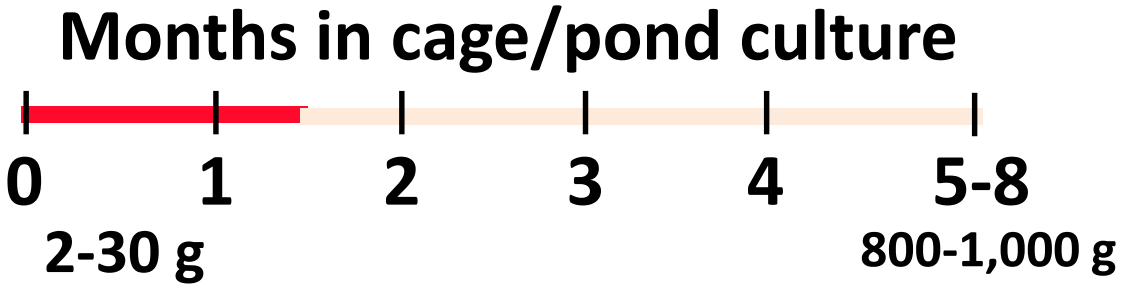
In 2015

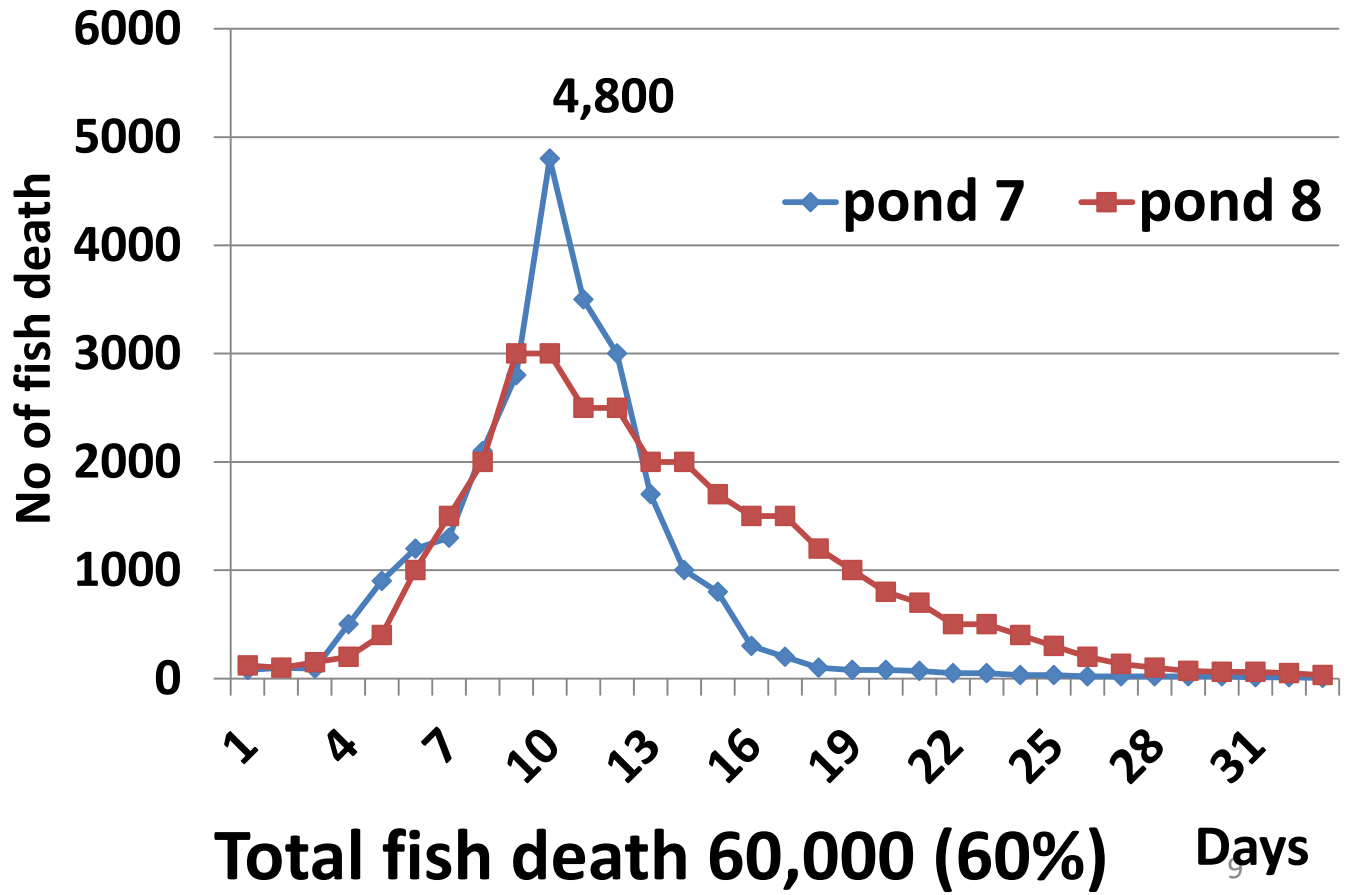
Mass mortality of tilapia in cage culture system

Massive mortality in red hybrid tilapia

Tilapia One Month Mortality Syndrome (TOMMS)



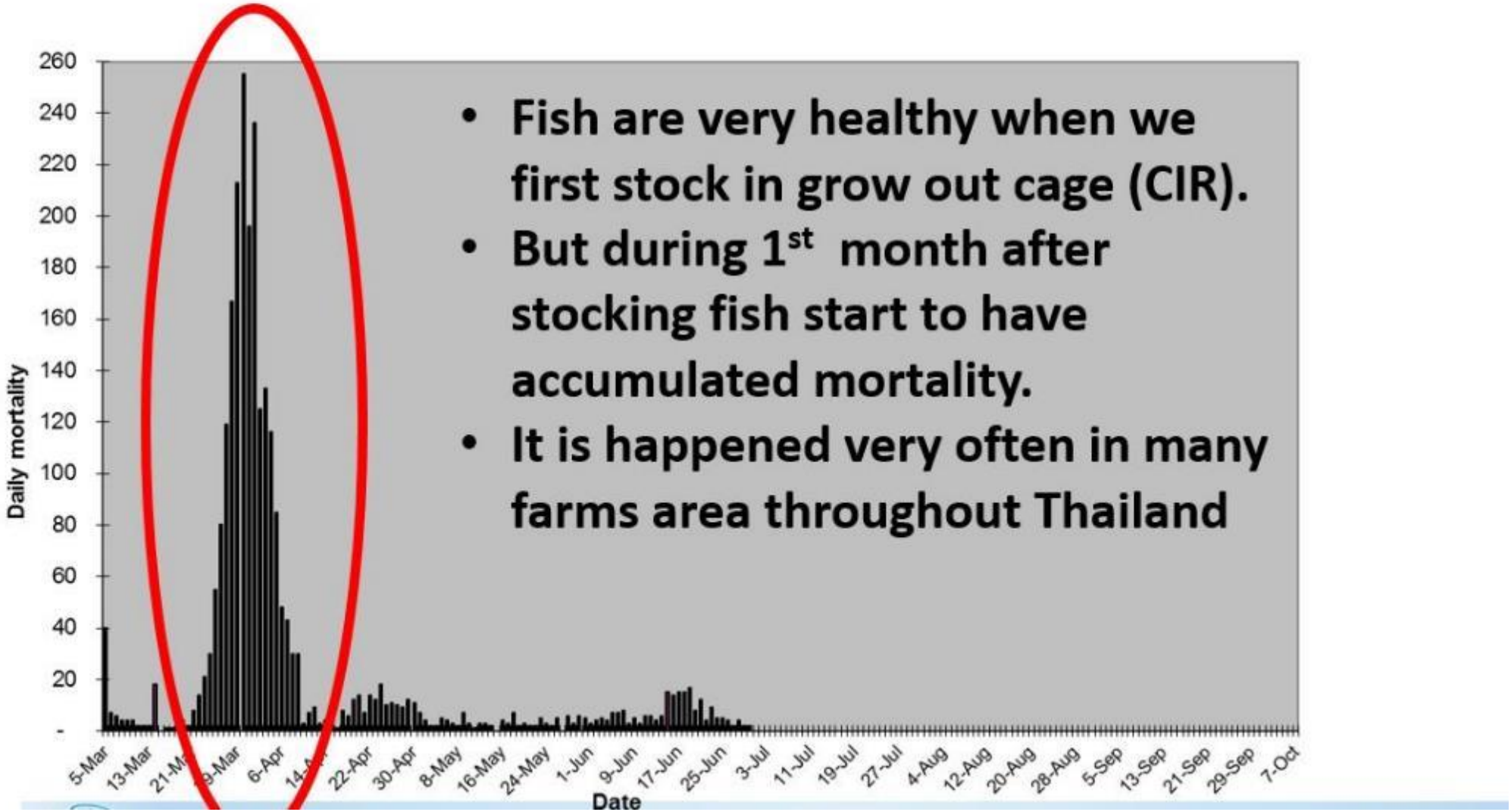
Pattern of fish death



Total fish death 60,000 (60%)

***Parinda kumchum , MSD ,Bangkok Thailand 2015

1st month post stocking mortality



- **Fish are very healthy when we first stock in grow out cage (CIR).**
- **But during 1st month after stocking fish start to have accumulated mortality.**
- **It is happened very often in many farms area throughout Thailand**

Daily mortality above 1-2% for 3 consecutive days

60-100 fish/cage Fish size 20 g

No history of high mortality since stocking

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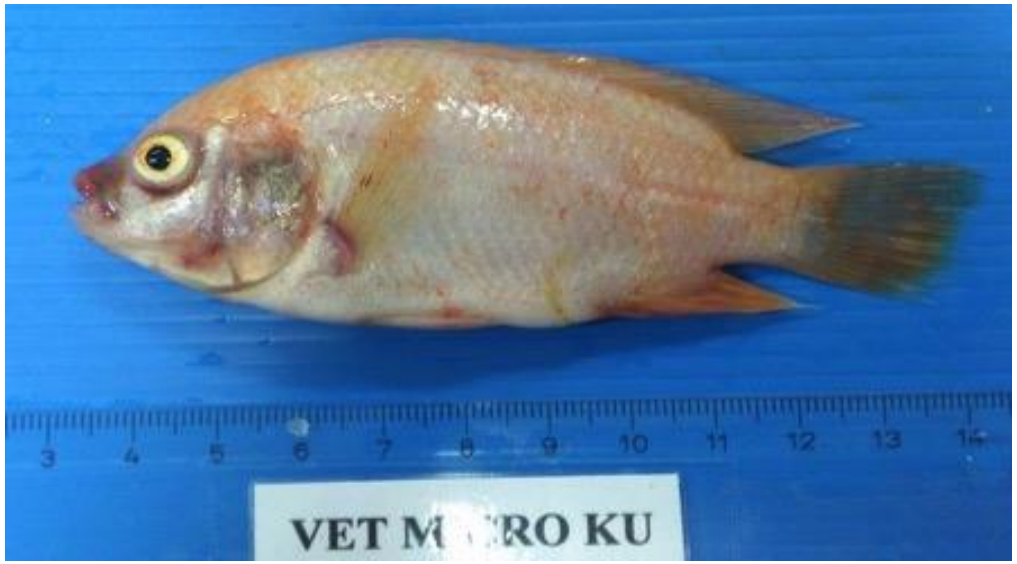
Gross signs


VET M RO KU


WIN SURACHETPONG

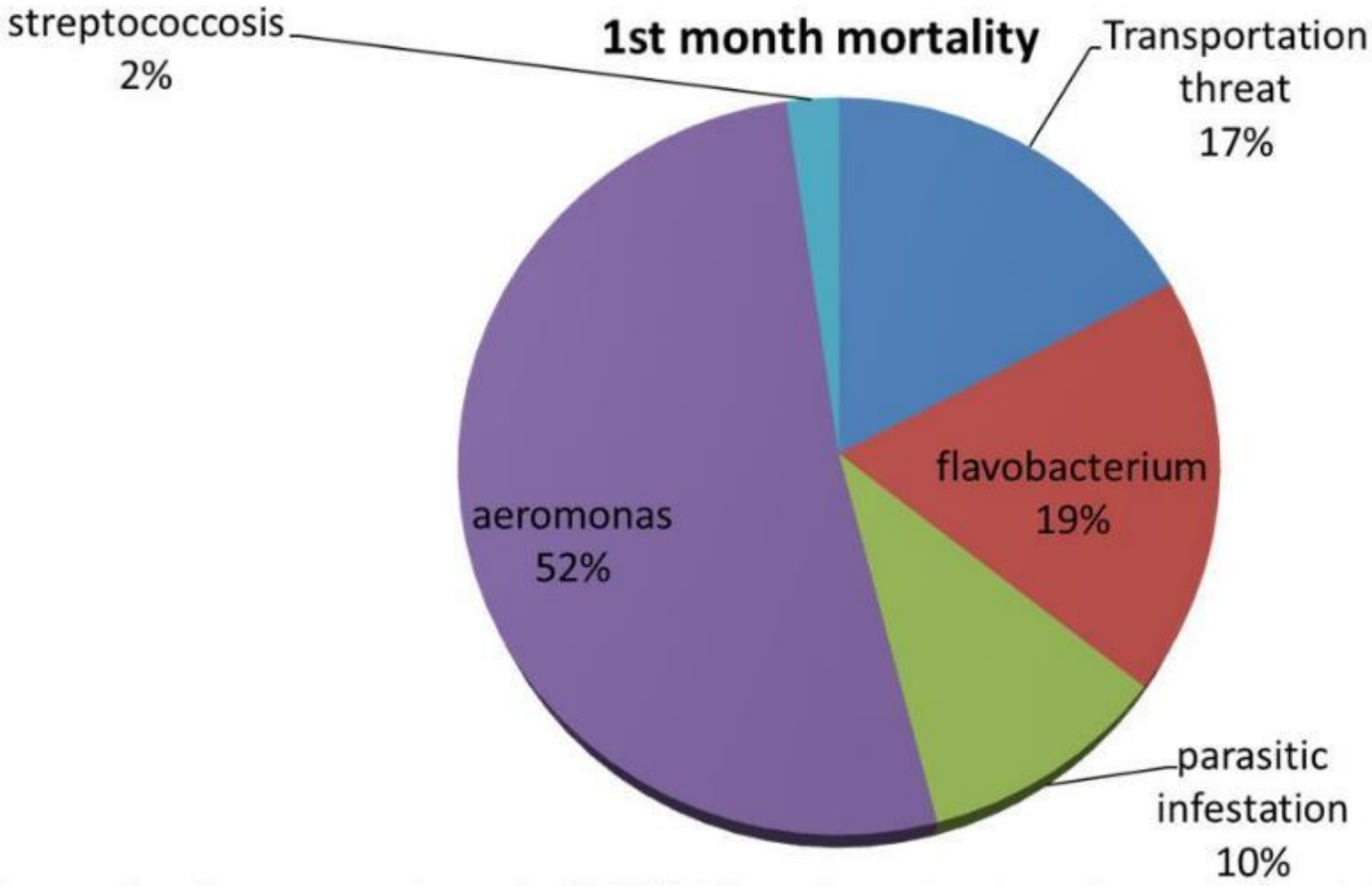

WIN SURACHETPONG


VET MICRO KU
WIN SURACHETPONG

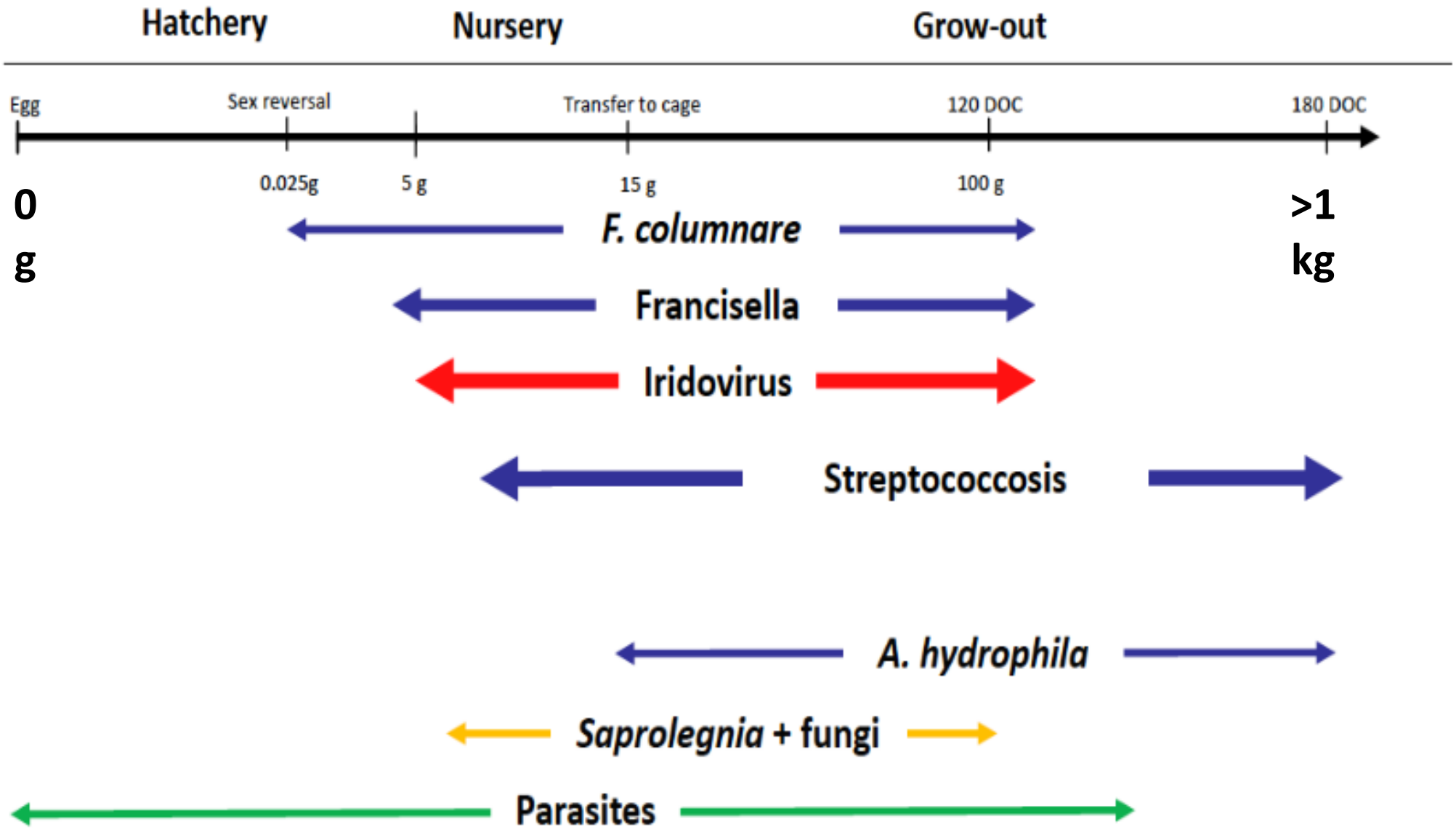
Clinical signs: Anemic fish

Bacterial culture results of TOMMS

Data between June and December 2015 in a hatchery farm (600,000 fingerlings)



Infectious diseases of tilapia



Economic impact of TOMMS

- Fry and Fingerling loss → Fry shortage
  - Mortality 50-90% (2-4 million US dollars)
- More impact on red tilapia than Nile tilapia
  - Shift from red to Nile tilapia

- Survivor → price ↑ ~30 g → 10-30 cent per fish
- Elimination of positive broodstock?
- Cost of farm management

Identification of a new emerging disease

"to open Pandora's box" means to perform an action that may seem small or innocent, but that turns out to have severely detrimental and far-reaching negative consequences. (Wikepedia)

JCM Journals.ASM.org

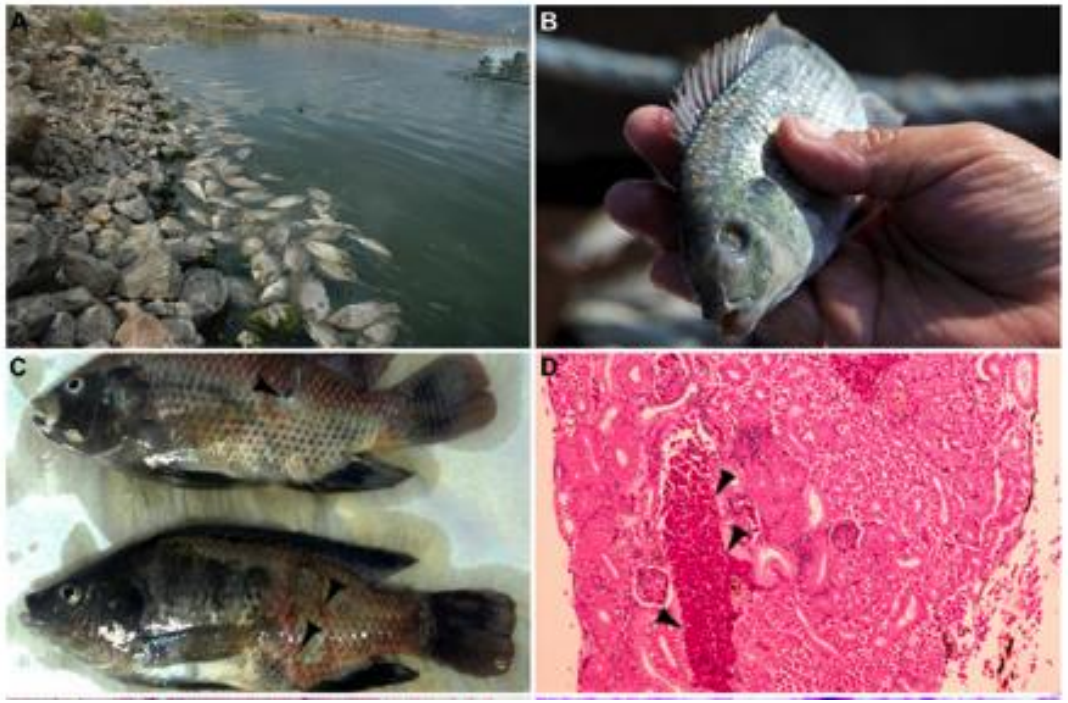
December 2014 Volume 52 Number 12 Journal of Clinical Microbiology p. 4137–4146

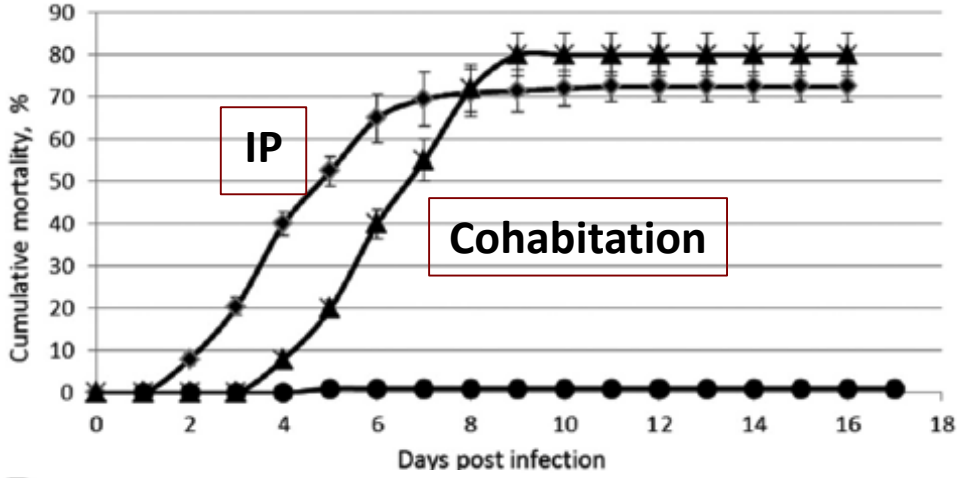
Identification of a Novel RNA Virus Lethal to Tilapia

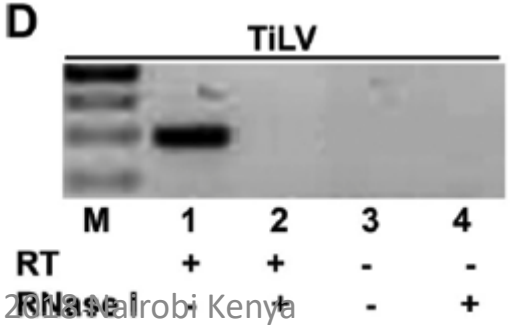
Tilapia Lake Virus: TiLV

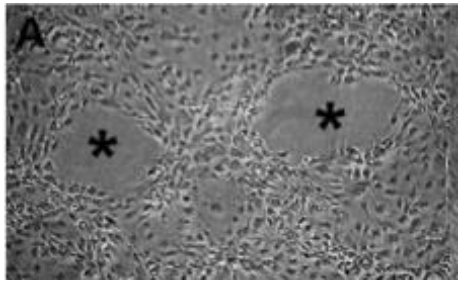
Marina Eyngor,[a] Rachel Zamostiano,[b] Japhette Esther Kembou Tsofack,[b] Asaf Berkowitz,[a] Hillel Bercovier,[c] Simon Tinman,[d] Menachem Lev,[e] Avshalom Hurvitz,[f] Marco Galeotti,[g] Eran Bacharach,[b] Avi Eldar[a]

Department of Poultry and Fish Diseases, The Kimron Veterinary Institute, Bet Dagan, Israel[a]; Department of Cell Research and Immunology, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel Aviv, Israel[b]; The Hebrew University-Hadassah Medical School, Jerusalem, Israel[c]; Department of Animal Facility, Faculty of Life Sciences, Bar Ilan University, Ramat Gan, Israel[d]; Ein Gev Fisheries, Kibbutz Ein Gev, Israel[e]; Dan Fish Farms, Kibbutz Dan, Upper Galilee, Israel[f]; Department of Food Science, Section of Veterinary Pathology, University of Udine, Udine, Italy[g]







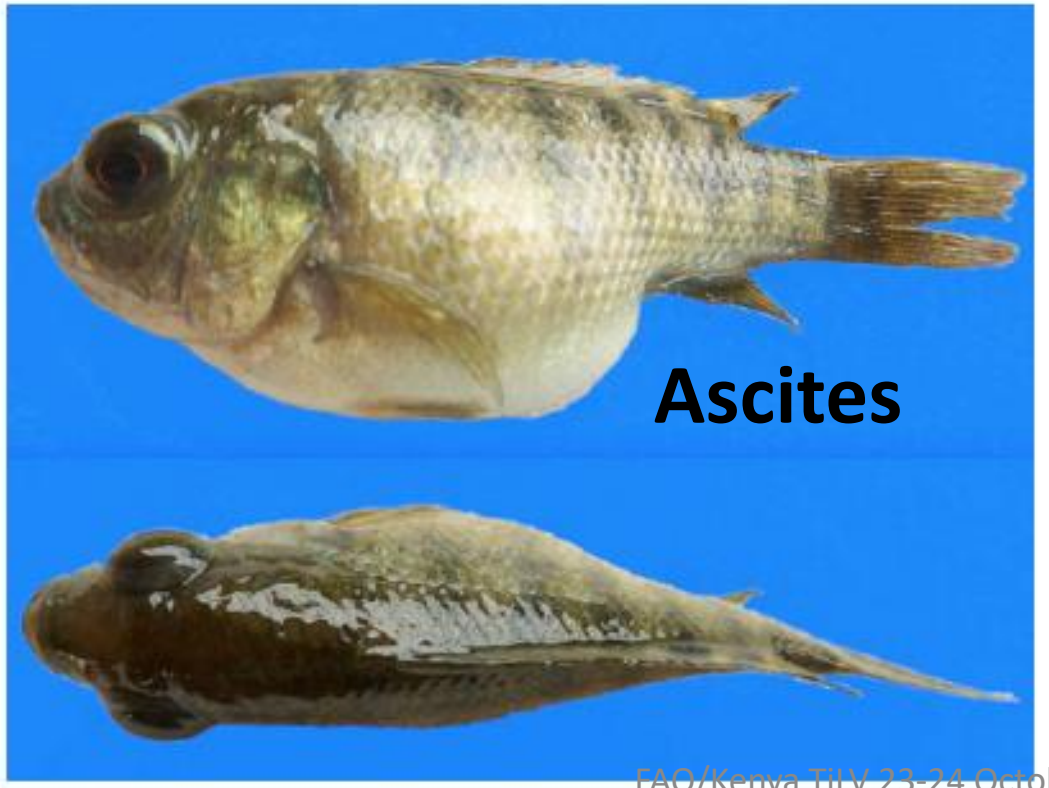


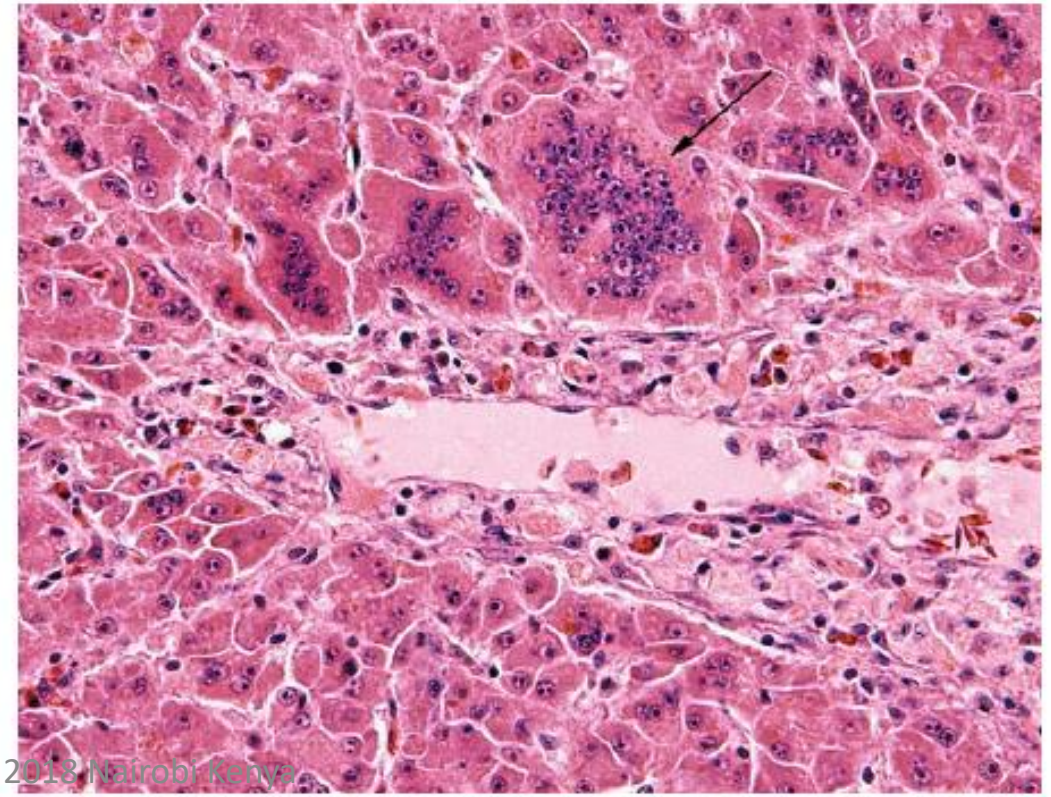
Syncytial hepatitis of farmed tilapia, *Oreochromis niloticus* (L.): a case report

Journal of Fish Diseases 2014, 37, 583–589

H W Ferguson[1], R Kabuusu[1], S Beltran[2], E Reyes[2], J A Lince[2] and J del Pozo[3]

1 Marine Medicine Programme, School of Veterinary Medicine, St George's University, St George, Grenada
2 Produmar S.A., Guayaquil, Ecuador
3 Department of Pathology, Royal (Dick) School of Veterinary Medicine, University of Edinburgh, Edinburgh, Scotland, UK

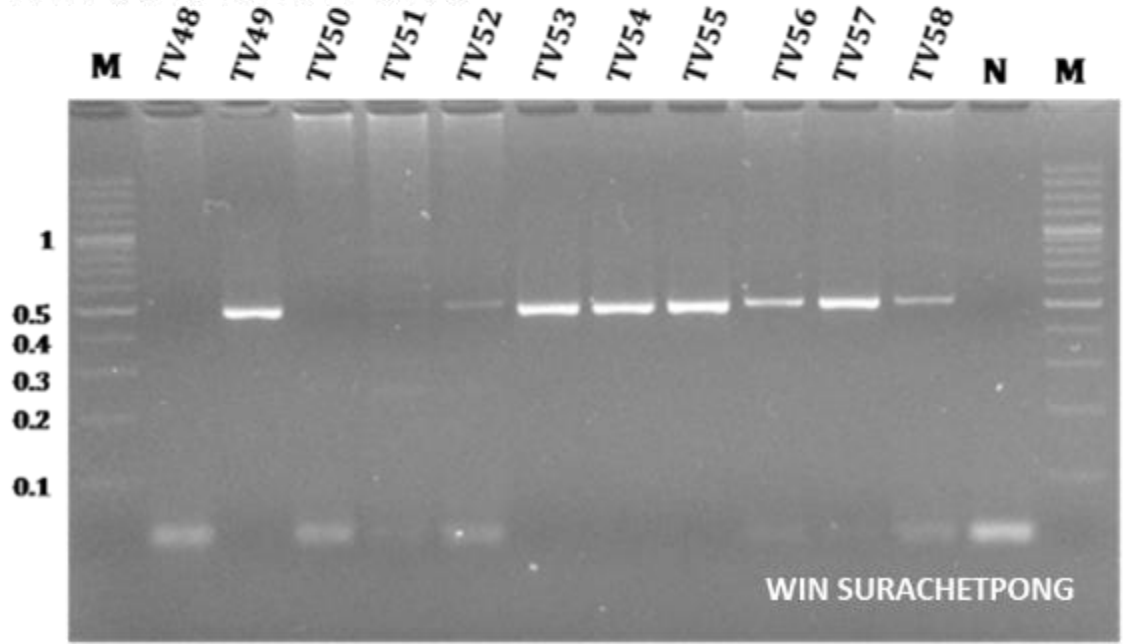


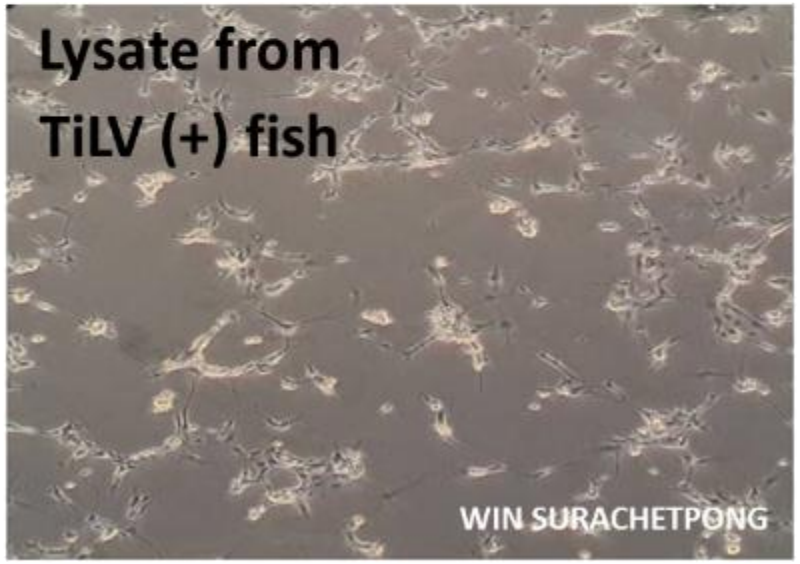


TOMMS & Tilapia Lake Virus ??

Win Surachetpong

Detection of TiLV in our samples (2015)

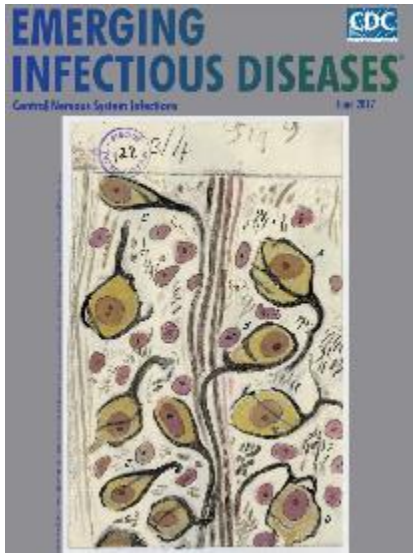


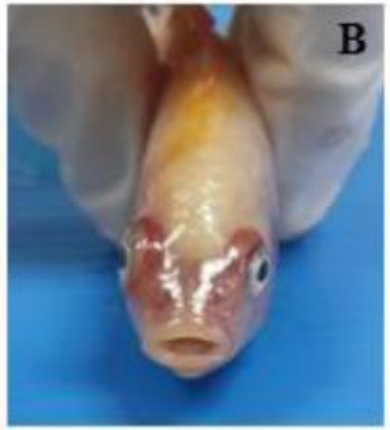


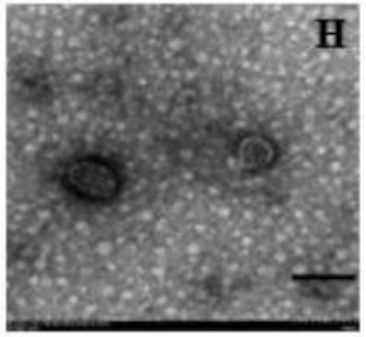
Epidemiology of TiLV

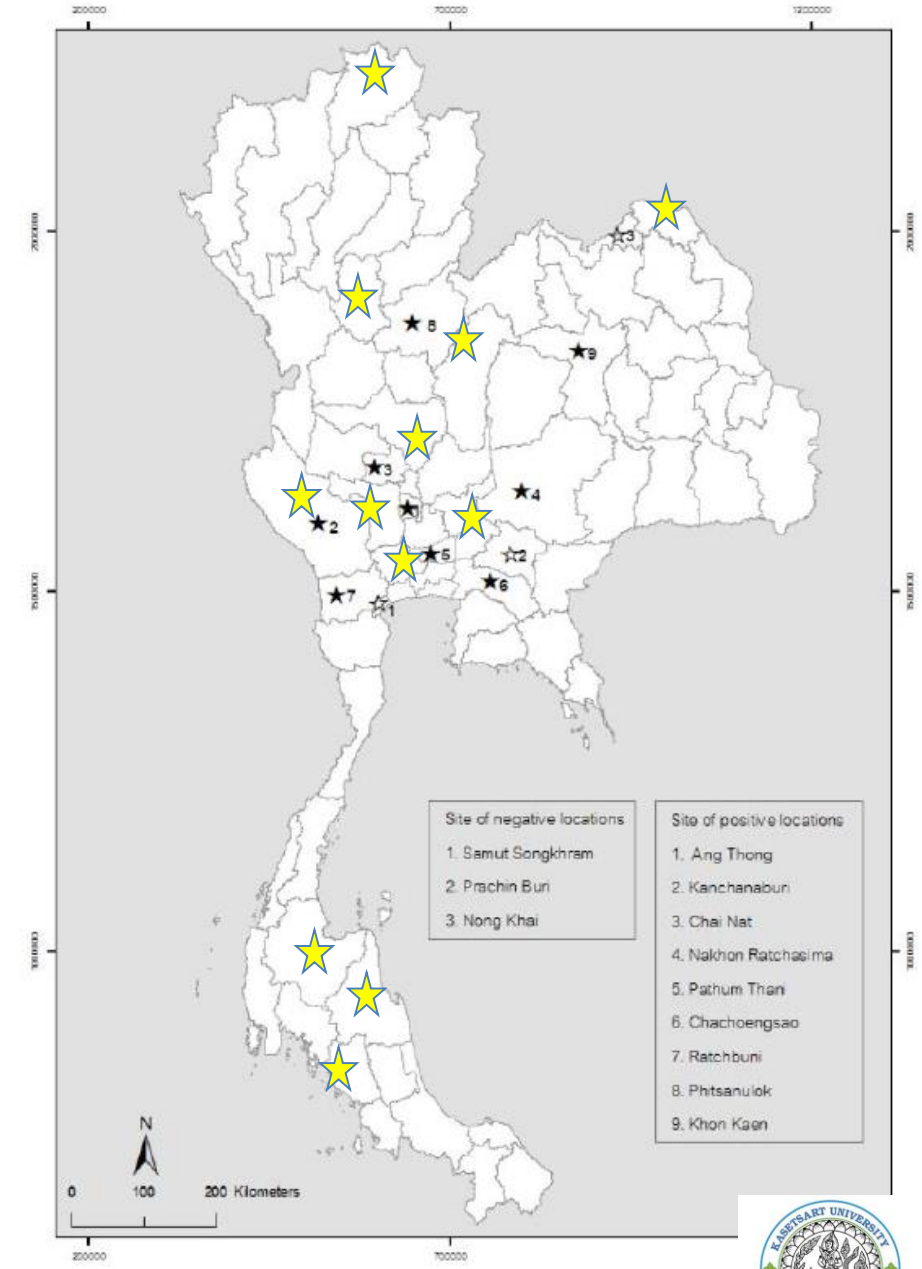
- From 32 outbreaks of high mortality → 22 are TiLV positive

- Bacteria, parasite and virus









Surachetpong et al., 2017

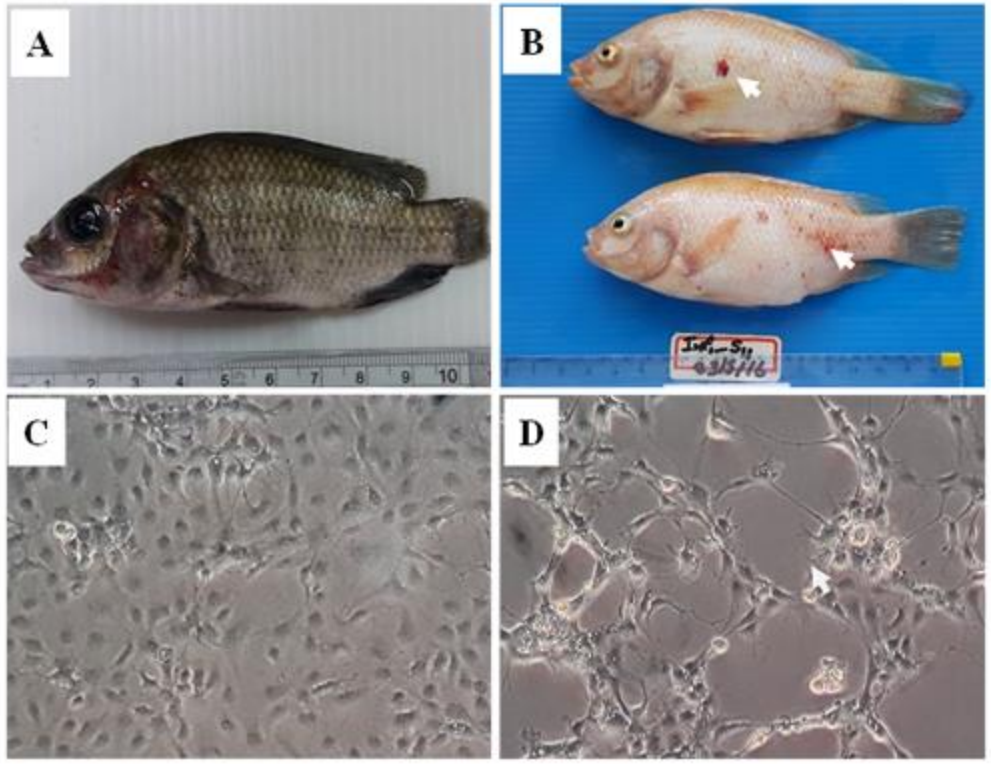
Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 23, No. 6, June 2017

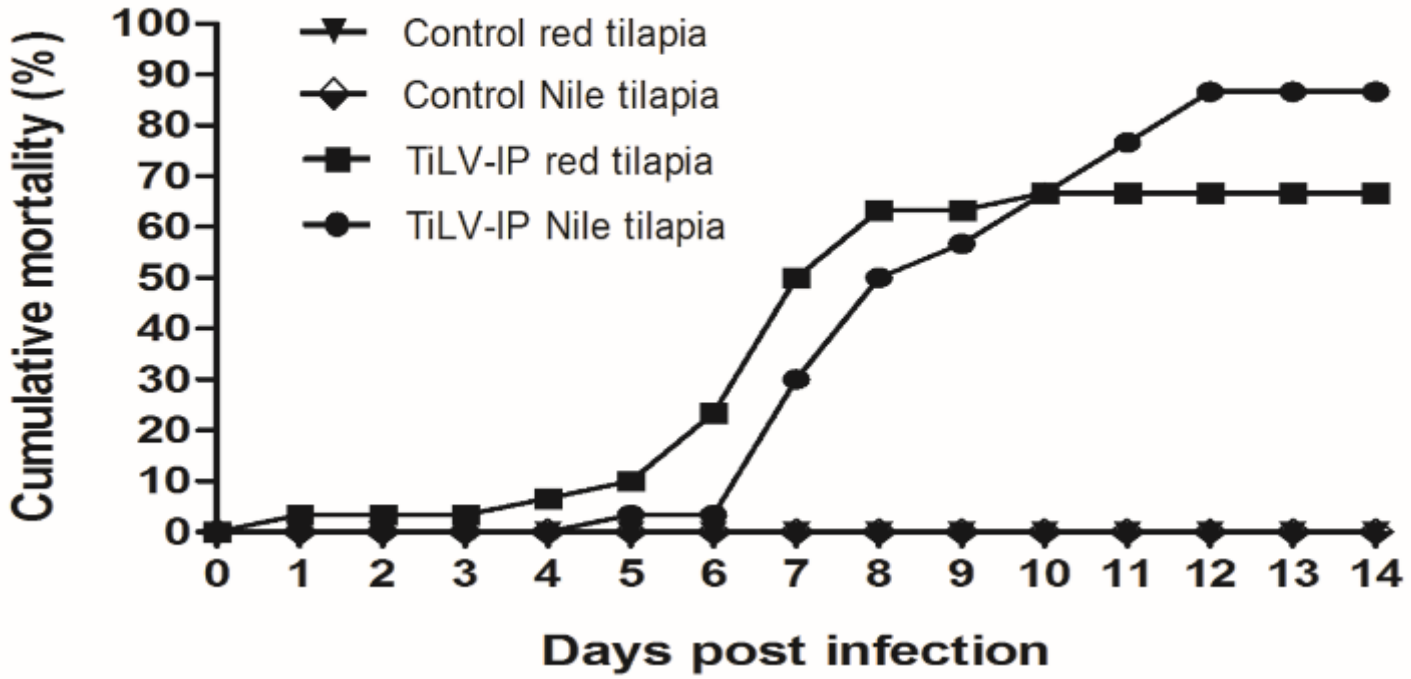
Veterinary Microbiology

Volume 207, August 2017, Pages 170–177

Experimental infection of Tilapia Lake Virus (TiLV) in Nile tilapia (*Oreochromis niloticus*) and red tilapia (*Oreochromis* spp.)

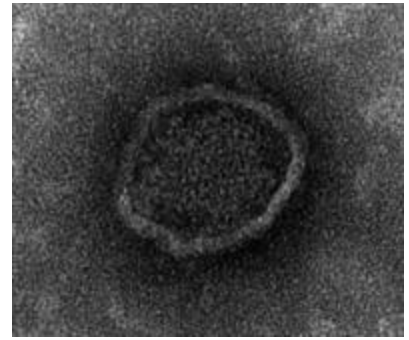
Puntanat Tattiyapong[a, b], Worawan Dachavichitlead[a, b], Win Surachetpong[a, b]





Current information on TiLV

- RNA, envelope, Orthomyxo-like virus
- Mainly affect tilapia, closely related species and giant gourami
- No report of harm to human or other animals
- **Strict biosecurity** reduces the impact of disease and spreading of the virus
- Not on the **OIE disease list**



Countries with TiLV positive

Modified from Al-Hussinee et al., 2019

3 continents and 15 countries

Massive mortality of red tilapia (2018) Malaysia

Win Surachetpong; Vet Med KU

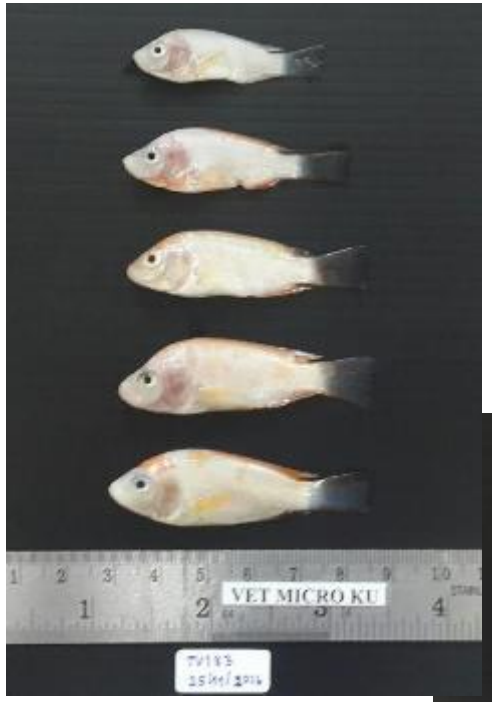
Massive mortality of Nile tilapia (2018) Indonesia

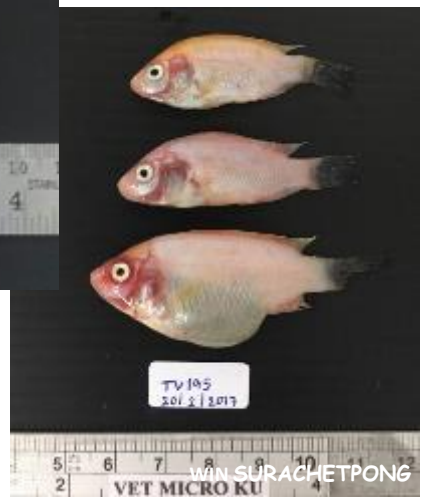
Win Surachetpong

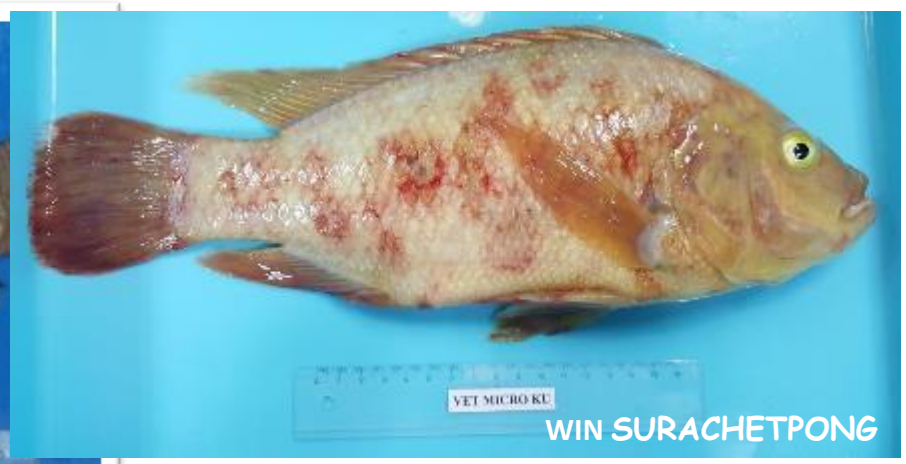
Peru (Taraporto)

- 300-400 g
- >40% mortality

All fish sizes are susceptible to TiLV infection







Aquaculture 497 (2018) 462–468

Contents lists available at ScienceDirect

Aquaculture

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

Susceptibility of important warm water fish species to tilapia lake virus (TiLV) infection

Phitchaya Jaemwimol[a], Pattarasuda Rawiwan[a,b], Puntanat Tattiyapong[a,b], Pattrawut Saengnual[c], Attapon Kamlangdee[d], Win Surachetpong[a,b,*]

Cyprinus carpio

Trichogaster pectoralis

Barbodes gonionotus

Lates calcarifer

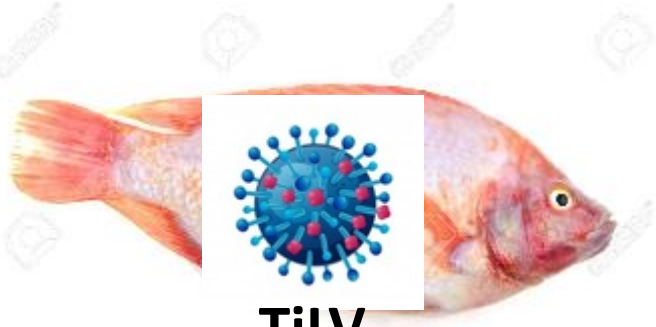
Anabas testudineus

Clarias macrocephalus

Pangasianodon hypophtthalmus

Chana striata

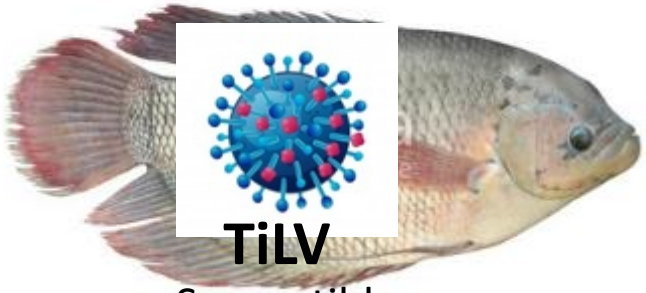
Most important warm water fish species are resistant to tilapia lake virus (TiLV) infection



TiLV

Susceptible

***Oreochromis* sp.**



TiLV

Susceptible

Osphronemus goramy

Aquaculture 497 (2018) 462–468

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Susceptibility of important warm water fish species to tilapia lake virus (TiLV) infection

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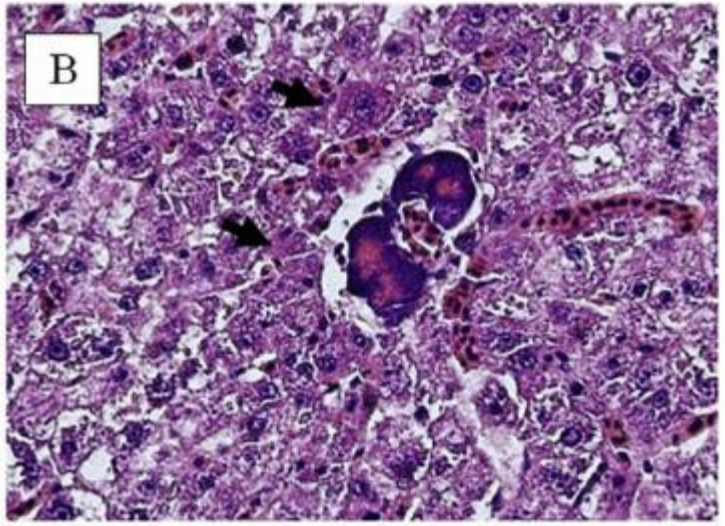
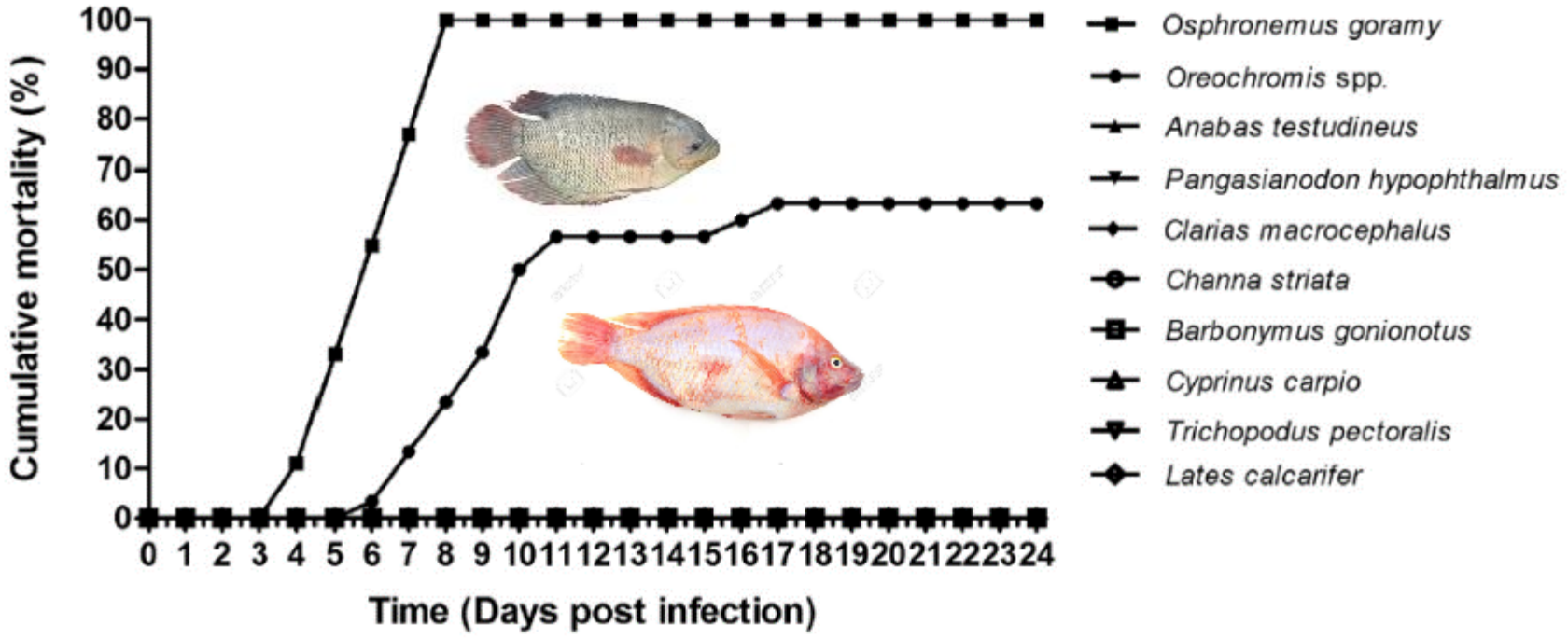
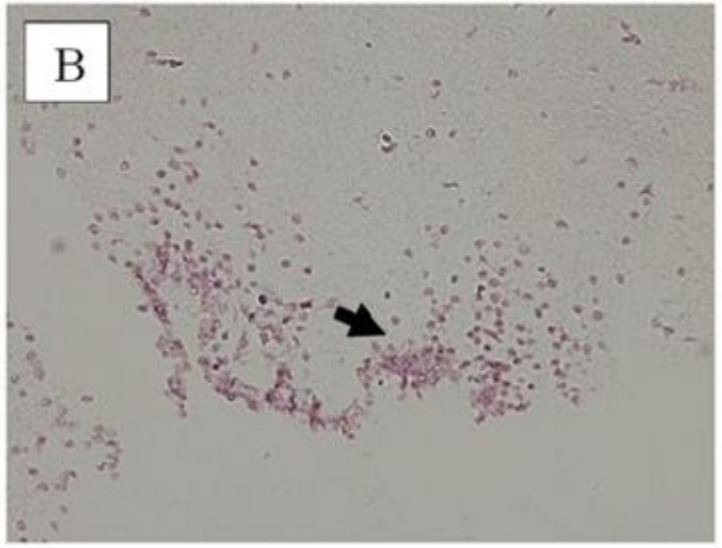


Syncytial cell in liver of giant gourami

Mortality of ten species after TiLV challenge

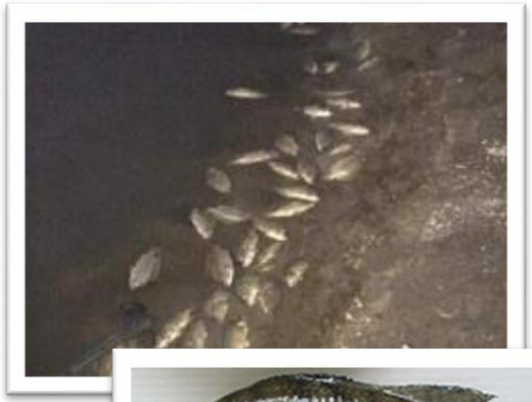




In situ hybridization signal in the brain of infected giant gourami

How do you know TiLV exists in your farm?

- High mortality, above 2-3% continuously
- Swimming at water surface
- Skin redness/erosion
- Red tilapia (pale body)
- Exophthalmos, scale protrusion



SHORT COMMUNICATION

WILEY Journal of Fish Diseases

Detection of Tilapia Lake Virus in Egyptian fish farms experiencing high mortalities in 2015

P Nicholson[1*] | M A Fathi[2,3*] | A Fischer[4] | C Mohan[5] | E Schieck[4] | N Mishra[6] | A Heinimann[7] | J Frey[1] | B Wieland[8] | J Jores[1,4]

Bacteria in the genus *Aeromonas* are commonly isolated from TiLV infected fish

Farm ID	Diseased fish/total fish sampled Morbidity rate (%)[a]	TiLV detected	*Aeromonas* species detected
1	7/13 (54%)	–	*A. veronii* *A. hydrophilia*
2	14/26 (54%)	–	*A. veronii*
3	13/24 (54%)	+	*A. veronii*
4	13/30 (43%)	–	*A. veronii* *A. ichthiosmia* *A. enteropelogenes*
5	21/40 (53%)	+	*A. veronii*
6	14/20 (70%)	–	*A. veronii* *A. enteropelogenes* *A. jandaei*
7	8/24 (33%)	+	*A. veronii* *A. ichthiosmia*
8	10/10 (100%)	+	*A. enteropelogenes* *A. hydrophilia*
WF	0/20 (0%)	–	*A. veronii*

Received: 25 September 2017 | Revised: 30 December 2017 | Accepted: 2 January 2018

DOI: 10.1111/jfd.12790

ORIGINAL ARTICLE

WILEY Journal of Fish Diseases

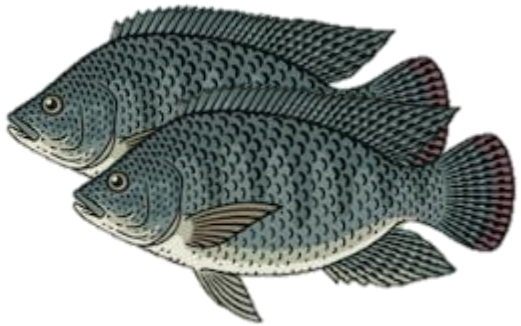
Detection of tilapia lake virus (TiLV) infection by PCR in farmed and wild Nile tilapia (*Oreochromis niloticus*) from Lake Victoria

K K Mugimba[1,2*] | A A Chengula[1,3*] | S Wamala[1,2] | E D Mwega[1,3] | C J Kasanga[3] | D K Byarugaba[2] | R H Mdegela[3] | S Tal[4] | B Bornstein[4] | A Dishon[4] | S Mutoloki[1] | L David[5] | Ø Evensen[1] | H M Munang'andu[1]

- **Examined 191 fish, 28 showed positive TiLV by PCR**
- **High prevalence in head kidney and spleen (lymphoid tissues)**

Transmission mechanisms

The transmission of TiLV between fish is primarily horizontal and high levels of virus are shed from infected fish, plus vertical transmission have been suggested.



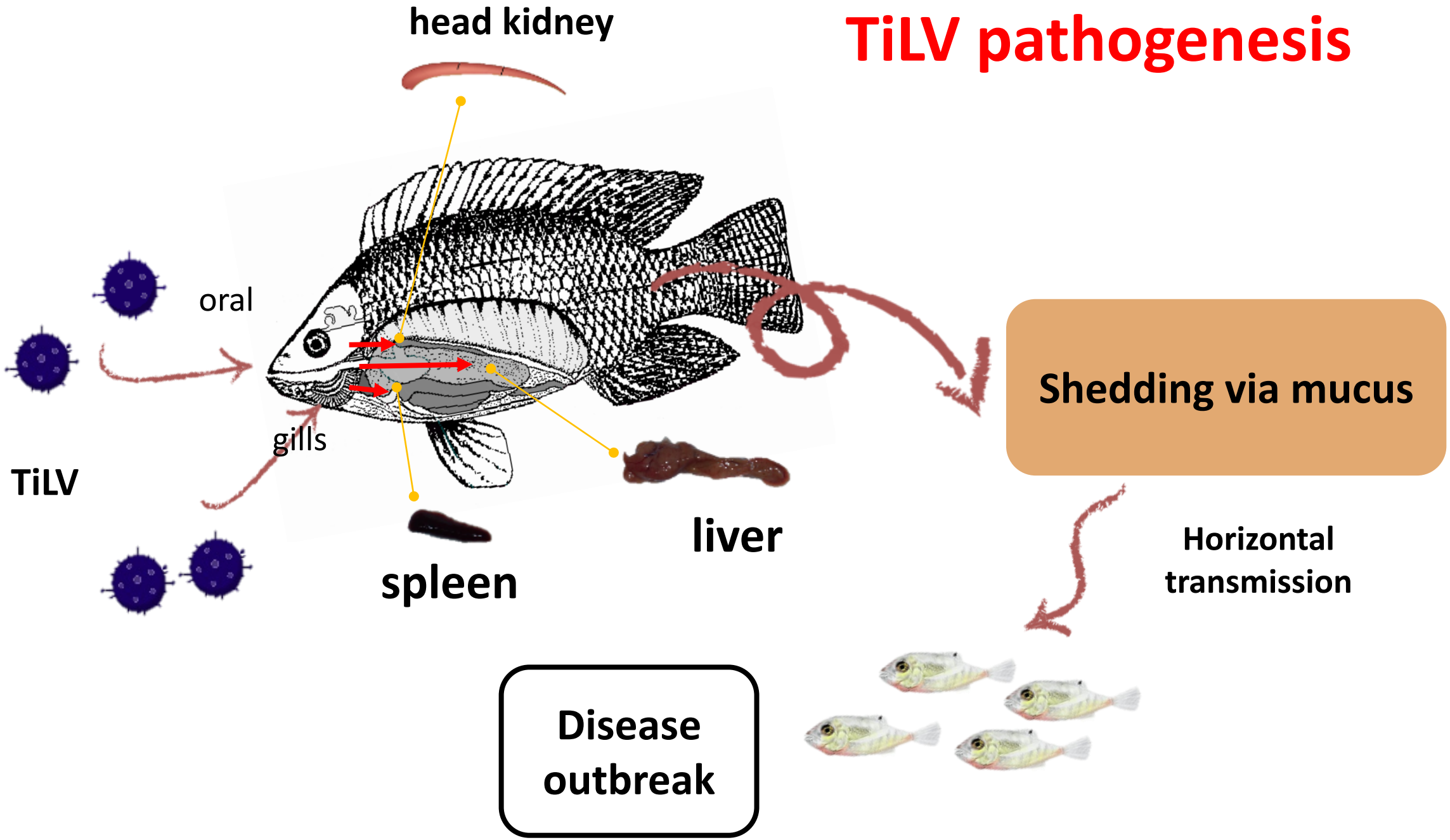
Vertical transmission

Horizontal transmission

Infected fry

Outbreak with high mortality

TiLV pathogenesis



Take home messages….

- **Tilapia Lake Virus is an emerging viral disease associated with high morbidity and mortality in tilapia**
- **To date, TiLV was reported in 15 countries**
- **Multiple infections of TiLV, bacteria and parasites are commonly found: Summer mortality, One month mortality syndrome**

Thank you for your attention