

# Egg Disinfection and Live feeding

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# Philosophy #1: disease is the results of interactions

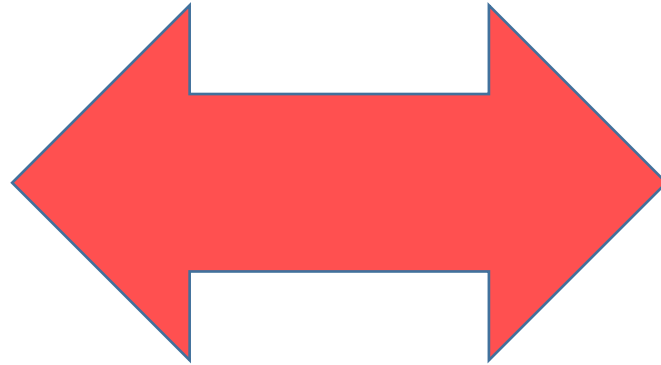
## Environments

### ❖ Biotic:

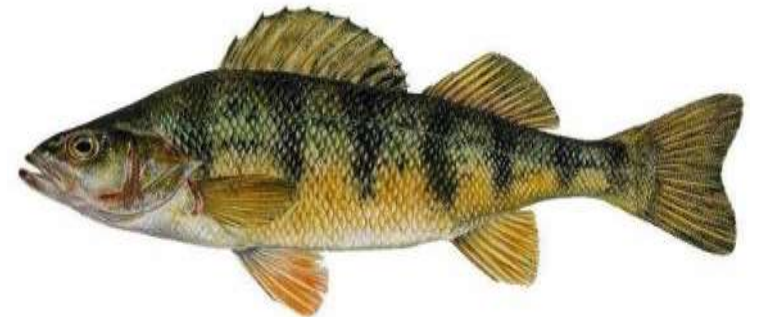
- Pathogens
- Predators
- Competition
- Density

### ❖ Abiotic:

- Water quality
- Handling
- Temperature shock



## Organism

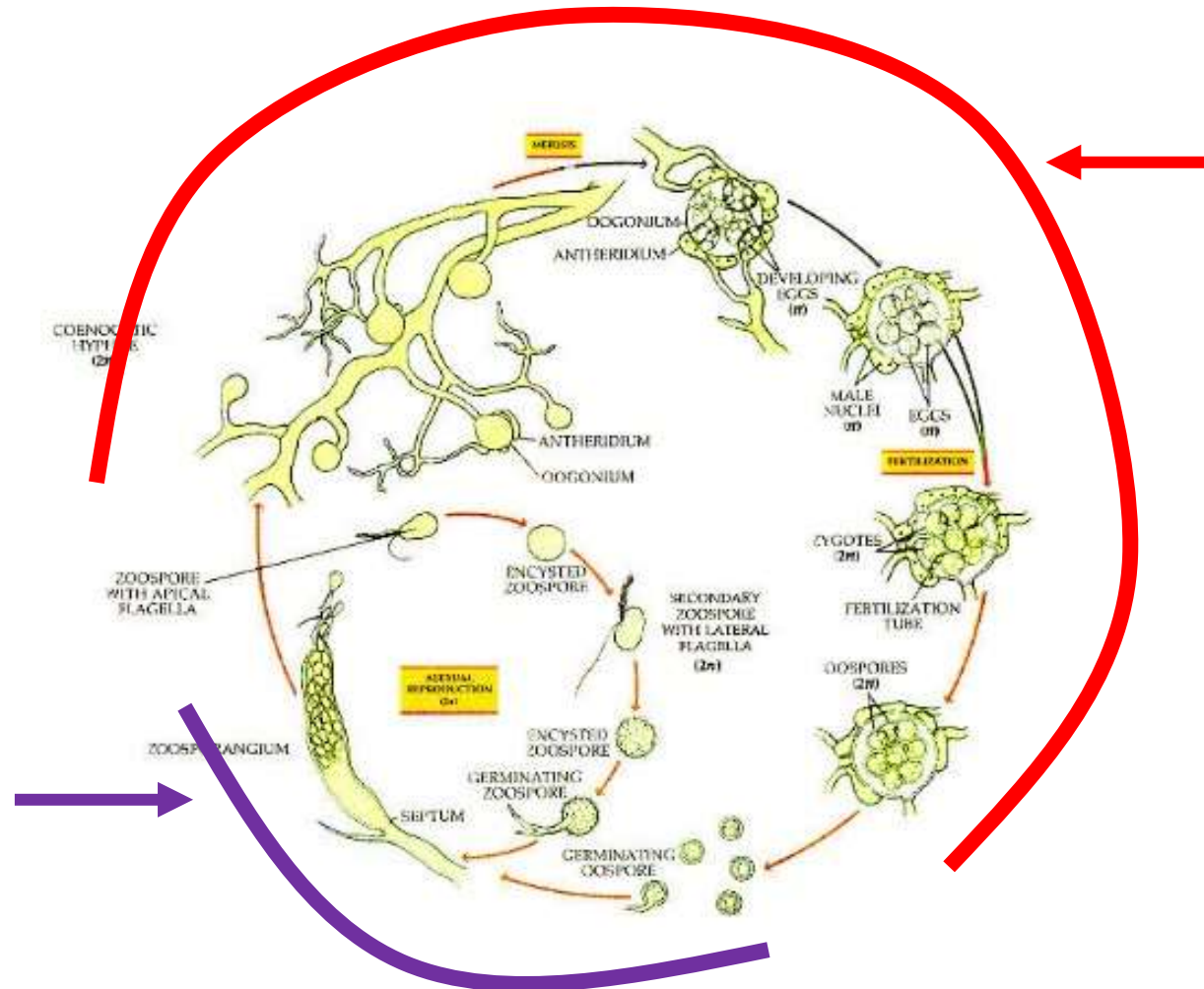


Philosophy #2: it's all about the critical dose (1) -  
activation of disease

## *Saprolegnia*

- Cotton moulds
- Cotton wool
- Water moulds
- Water molds
- Fungus
- Oomycetes

# In the water



## On the body

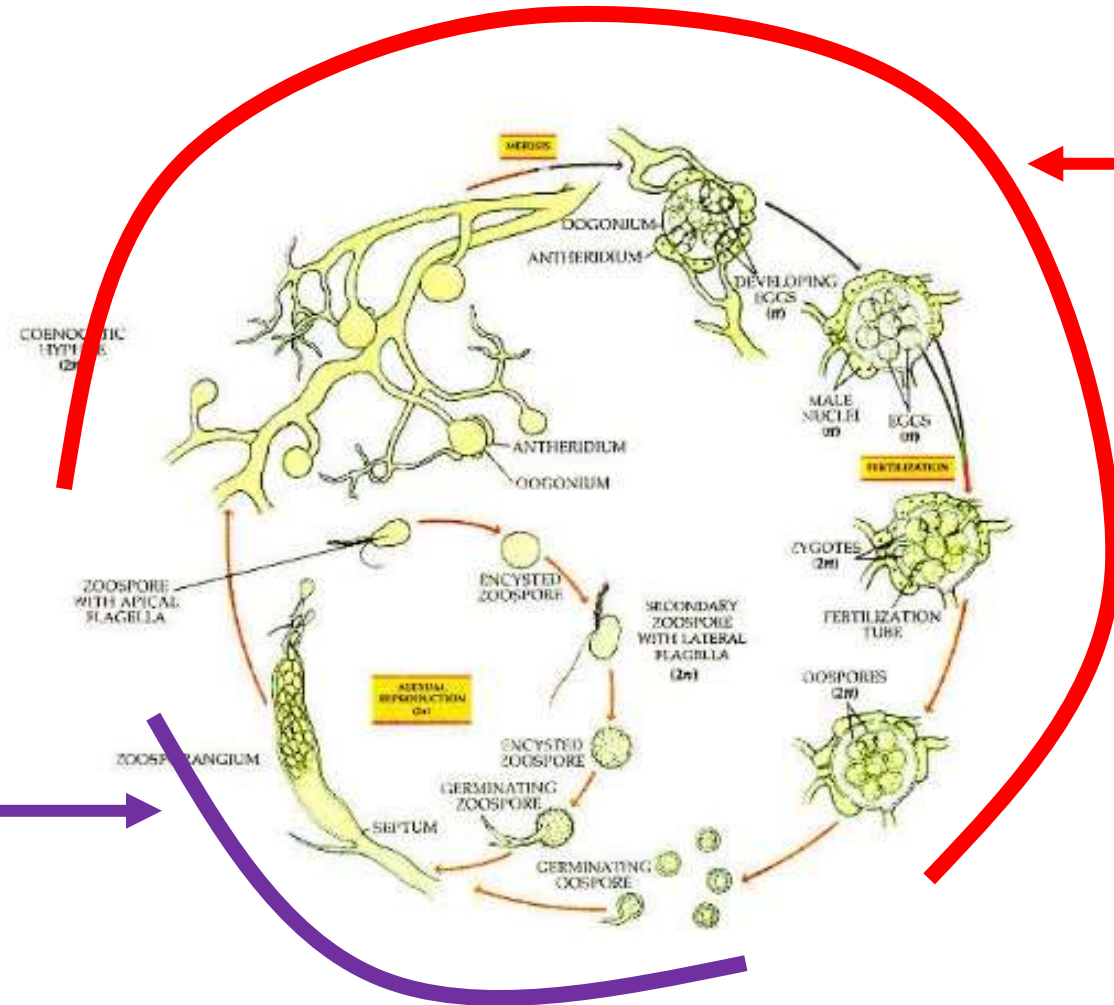
Biology of plants  
Raven et al. 1999

# Philosophy #2: it's all about the critical dose (2) - suppression of pathogens

Treatment dose and duration: kill or suppress pathogens while keep eggs or fish survive

Suppress

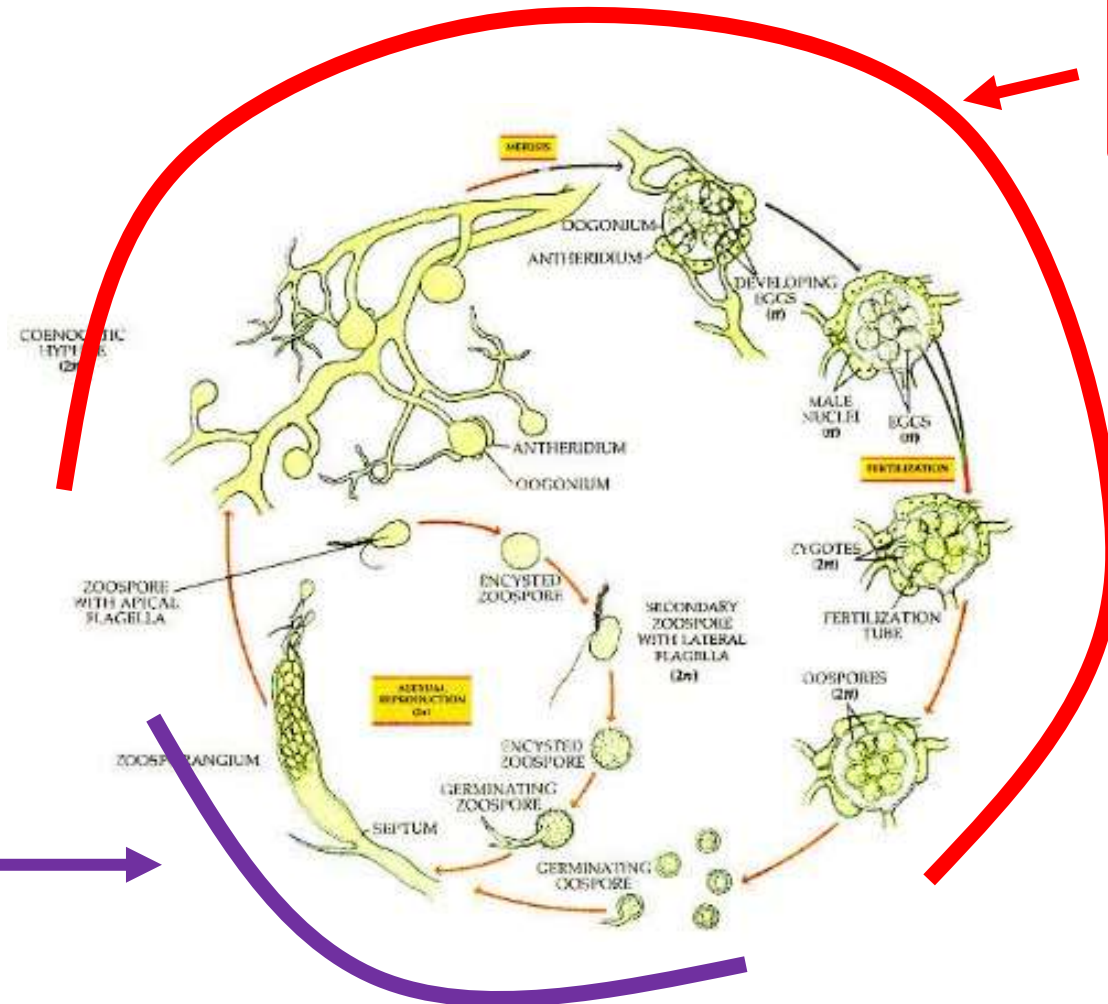
Kill



## Philosophy #2: it's all about the critical dose (3) - survive or die

Once hyphae reached a specific amount, egg or fish has little chance of recovery, which is the most common case

Thrive



- Deprive oxygen
- Lower immunity



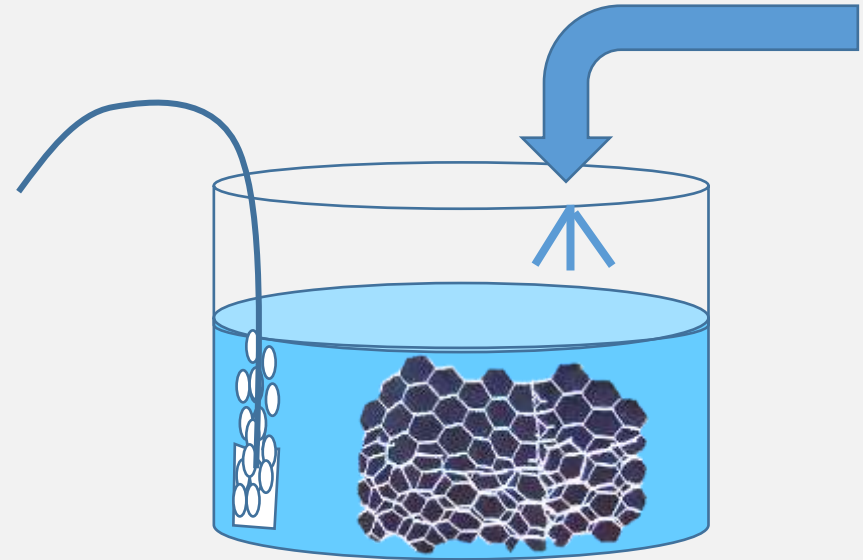
# Philosophy #3: prevention is the best strategy (1) - chemical treatment



Dead eggs or sick fish provide excellent substrate for water molds

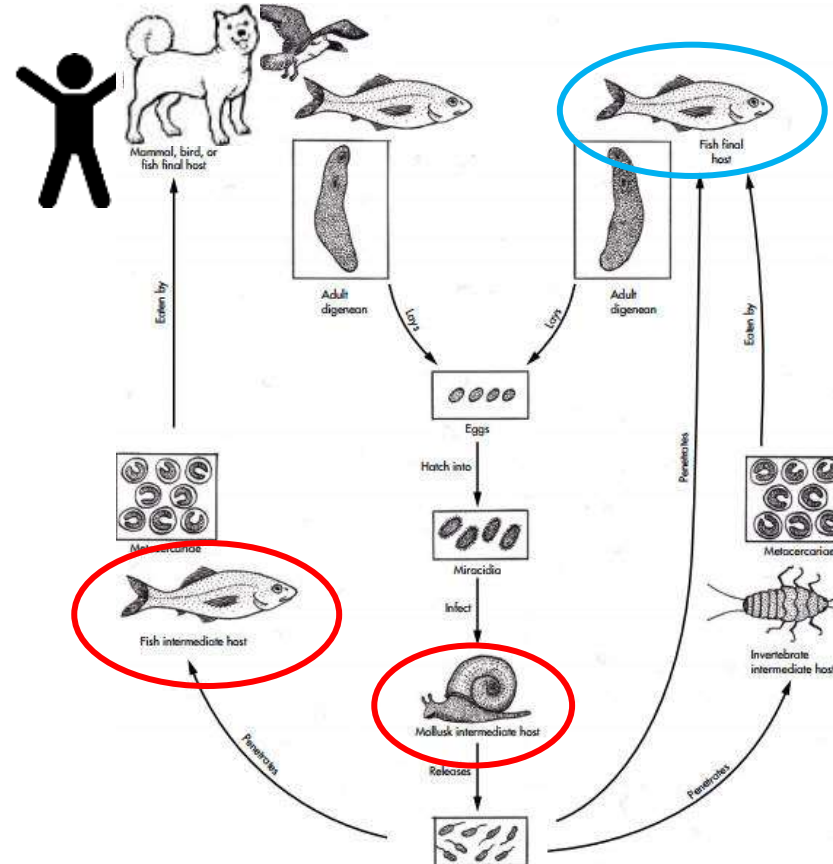
# Philosophy #3: prevention is the best strategy (2) - proper management

- Water quality
- Water flow
- Inlet system
- Aeration
- Density
- Handling
- Cross infection: tank, net, container, ...



# Philosophy #3: prevention is the best strategy (2) - proper management

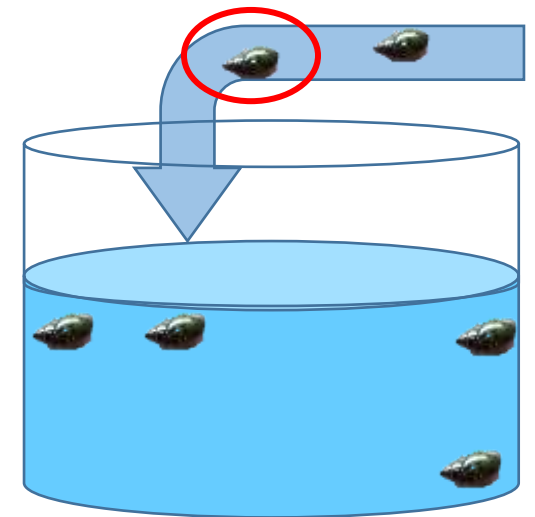
- Bury eggs or fish body
- Restricting access -  
Human and pets



Life cycles of digeneans infecting fish

- Replace or disinfect old inlet pipes

intermediate host





# Philosophy #3: prevention is the best strategy (2) - proper management

- Your memory has a capacity, please take a note

Daily Operations Pikecon Aquaculture Facility - ~~July 14~~ July 15

Species: Perch Pond Number(s): \_\_\_\_\_

Investigator(s): \_\_\_\_\_ Protocol Number: \_\_\_\_\_

	7E	7F	3F	3G							Observer
Date											
1	7.7										CB
2	7.3										CB
3	7.5	12.3	7.6	22.3	7.0	16.0	7.2	16.6	Bell's	normal	CB
4	8.4	12.2	8.5	23.0	7.3	16.1	7.5	16.7	Bell's	normal	CB
5	7.6	12.3	7.8	22.3	7.2	16.0	7.5	16.6	Bell's	normal	CB

**Daily operation**

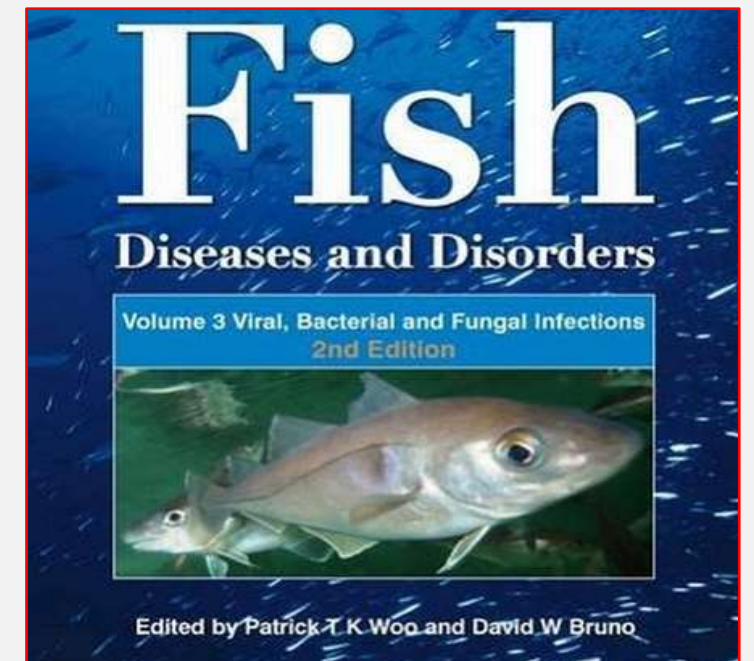
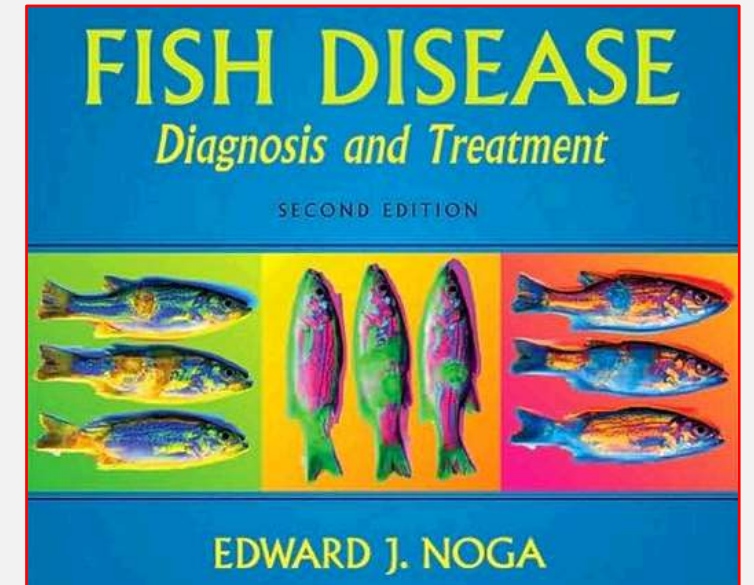


# Philosophy

- ❖ disease is the results of interactions
- ❖ It's all about the critical dose
- ❖ prevention is the best strategy

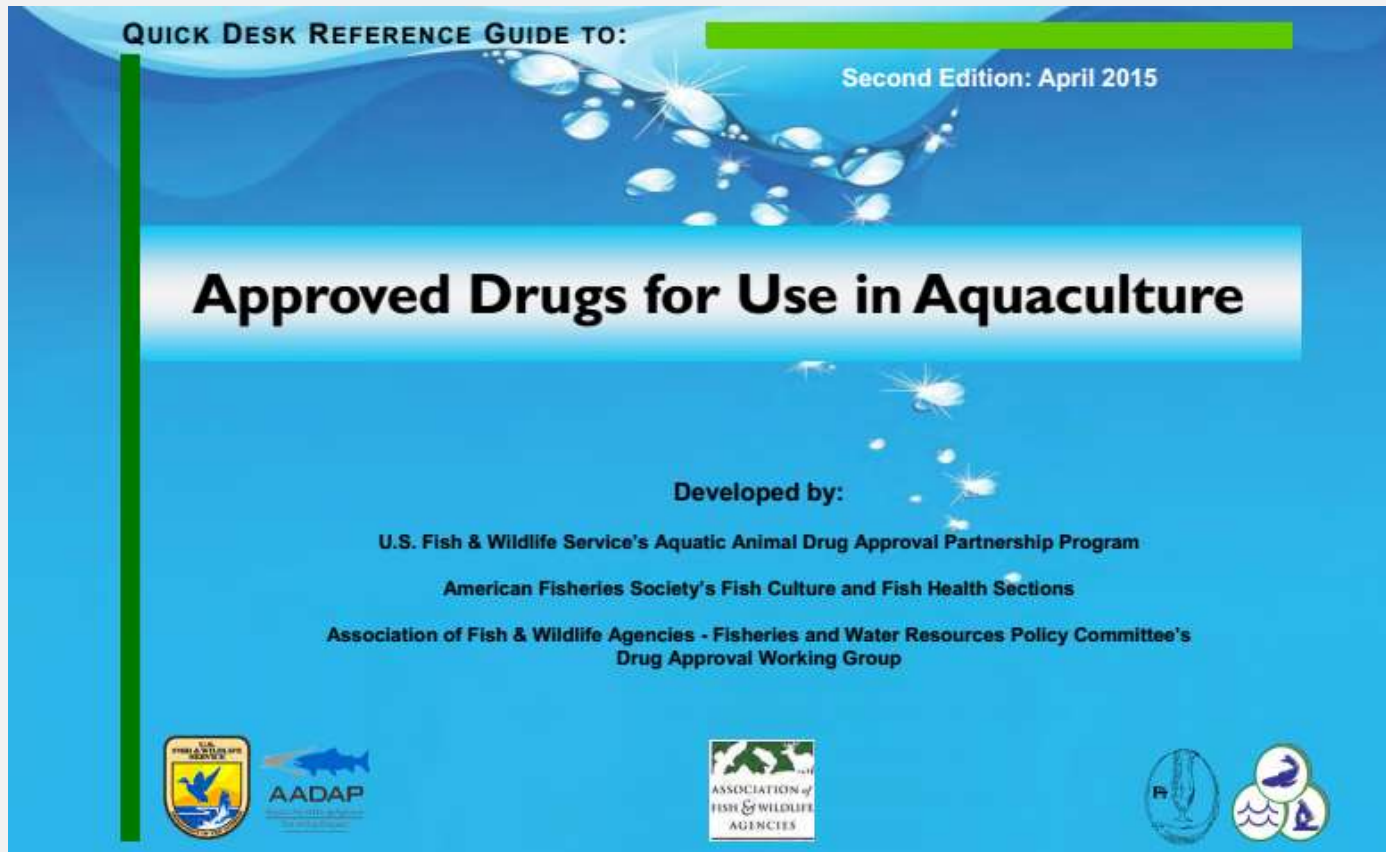
# Practice #1: you need a solution

- Can you prevent/identify the disease?
- Did you find reliable treatments?



# Practice #1: you need a solution

- Is the chemical FDA approved?



- <https://www.fws.gov/fisheries/aadap/PDF/2nd-Edition-FINAL.pdf>

# Practice #1: you need a solution

- FDA low regulatory priority aquaculture drugs for food fish  
(conditions should be met)

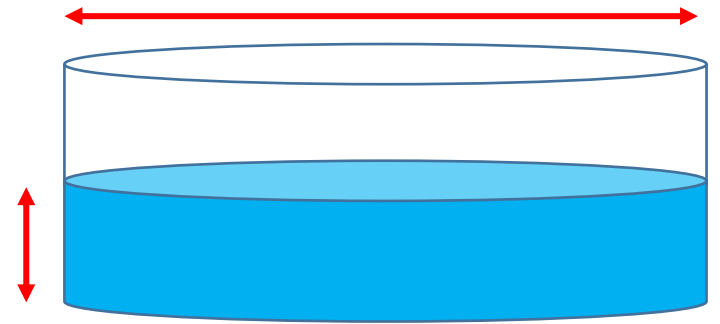
Acetic acid, Calcium chloride, Calcium oxide, Carbon dioxide gas, Fuller's earth, Garlic, Ice, Magnesium sulfate, Onion, Papain, Potassium chloride, Povidone iodine, Sodium bicarbonate, Sodium chloride, Sodium sulfite, Thiamine hydrochloride, Urea and tannic acid



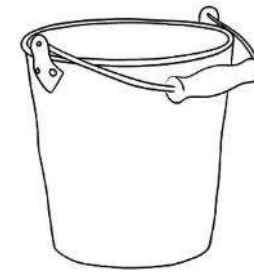
# Practice #1: you need a solution

## ❖ Set up a treatment plan

- Calculate the water volume
- Calculate the amount of chemicals needed
- Preliminary testing on a small number
- Take a note in details



uL/L, mg/L, ppm, ppt ...



## Practice #2: step-by-step solution for perch ribbon

- Identified the disease:  
Water molds



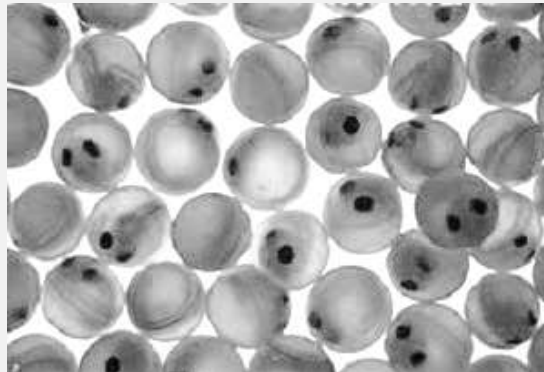
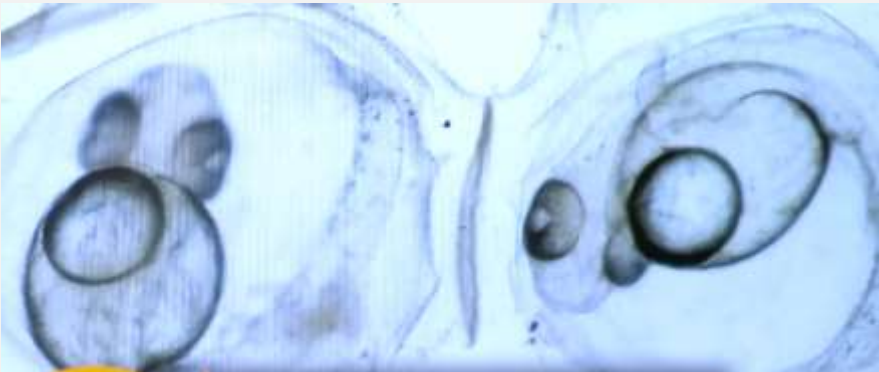
## Practice #2: step-by-step solution for perch ribbon

- Found a solution – formalin
- Approved by FDA
- inexpensive



## Practice #2: step-by-step solution for perch ribbon

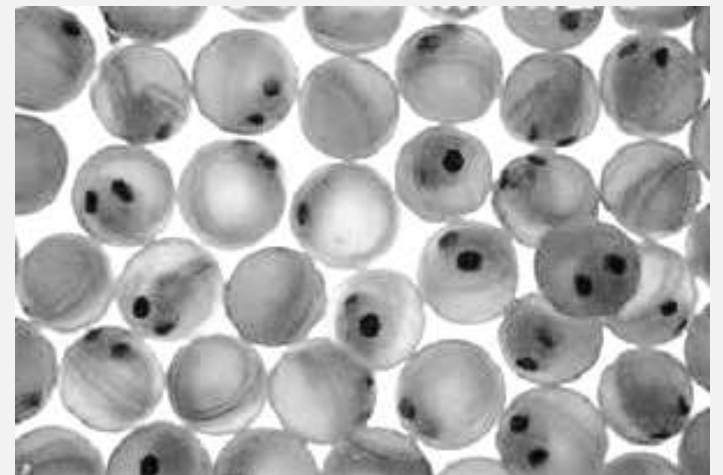
- 25-50 ppm ( $\mu\text{L/L}$ )
- Starting from the second day until eggs are eyed
- Water is flowing through during treatment



# Practice #2: step-by-step solution for perch ribbon

## ❖ Effects vary – Why

- Concentration
- Alternatives
- Effective dose and treatment period are dependent on water flow
- Totally stop formalin when eggs are eyed (last for 2-3 days)



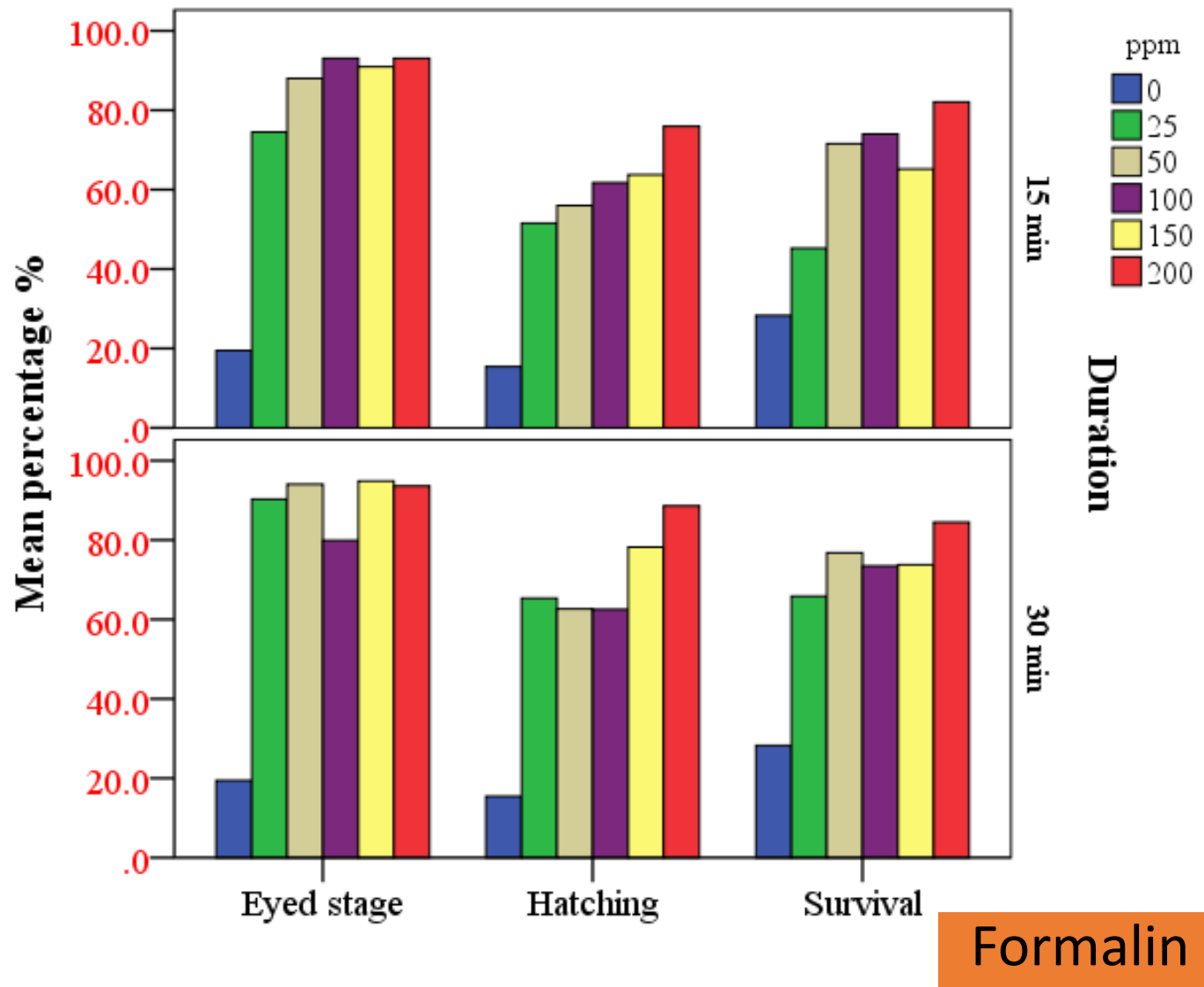


# Practice #2: step-by-step solution for perch ribbon



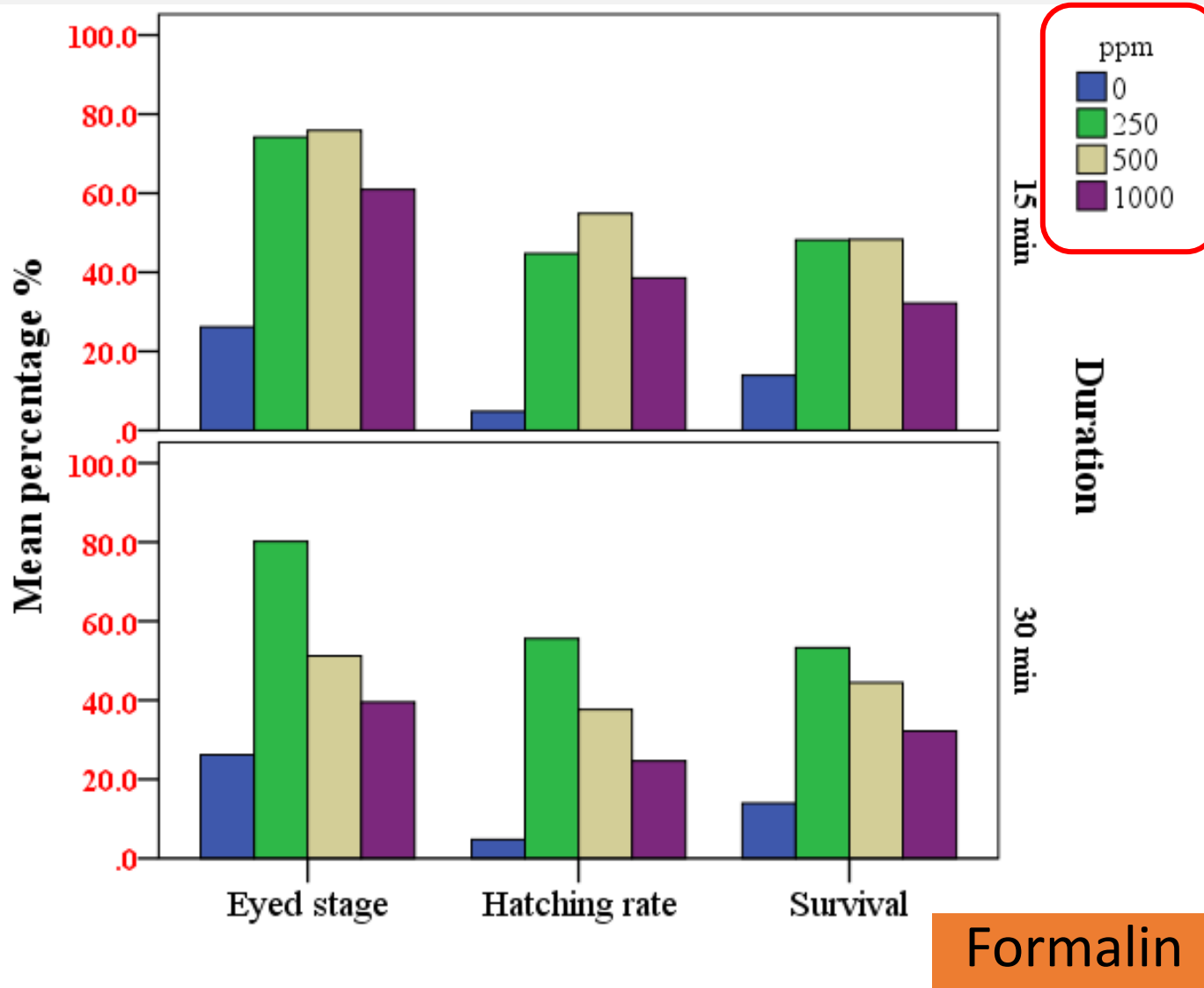
- Formalin, Iodine, and salt
- Different concentrations
- Treat for 15 min or 30 min

## Practice #2: step-by-step solution for perch ribbon



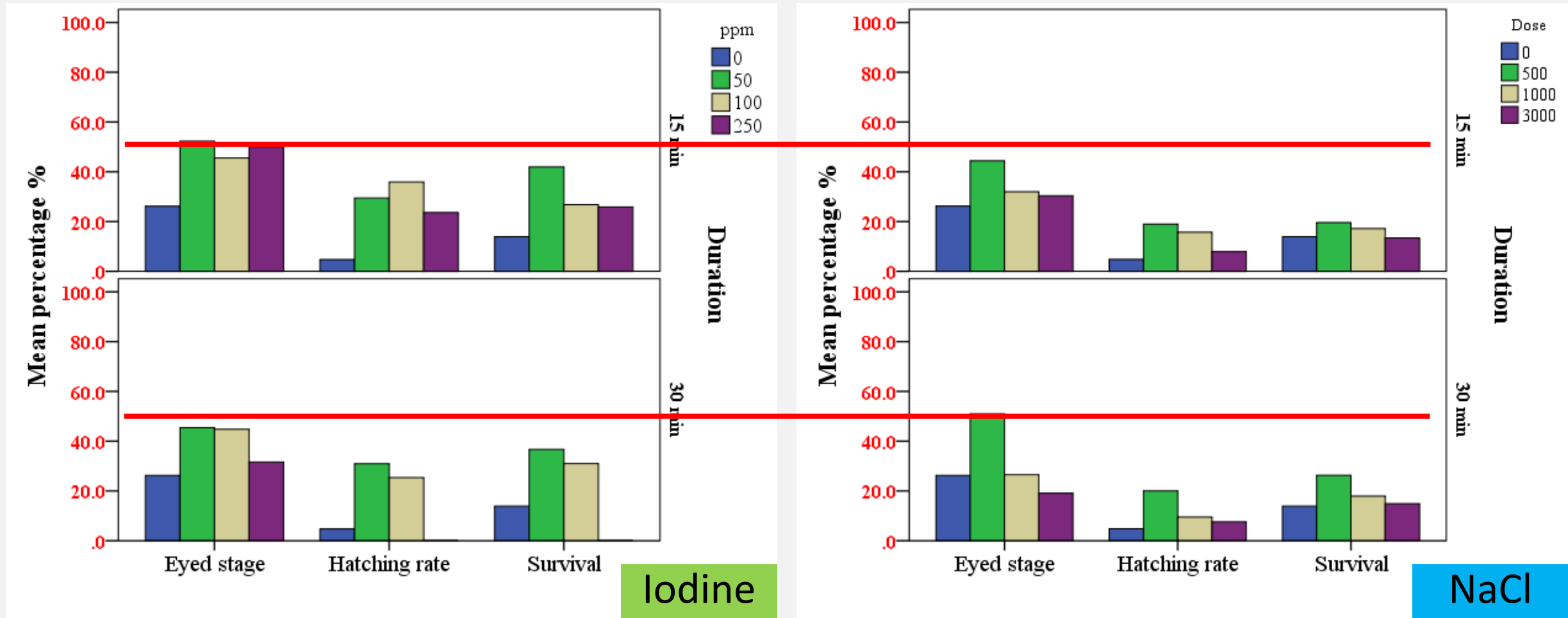
- The best results were within 200 ppm group
- 15 min was enough

## Practice #2: step-by-step solution for perch ribbon



- Dose should not be higher than 250 ppm

# Practice #2: step-by-step solution for perch ribbon



Not effective as formalin

## Practice #2: step-by-step solution for perch ribbon

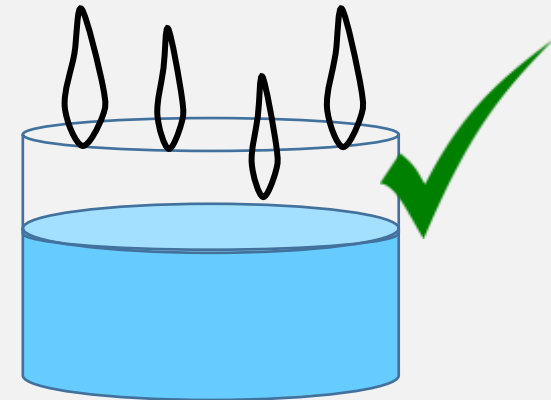
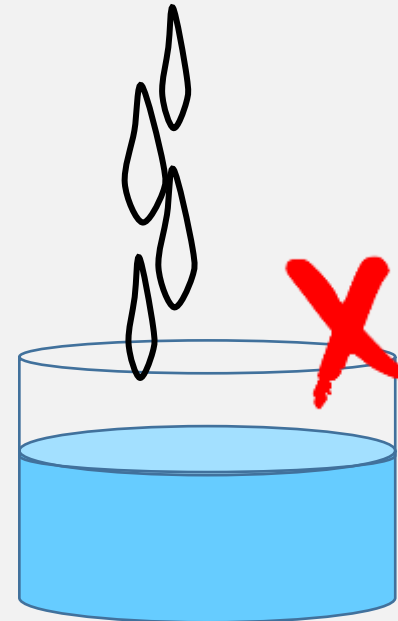
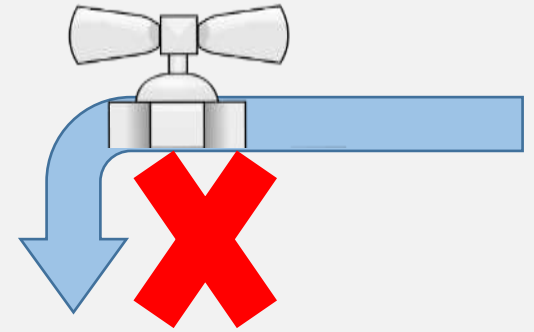
- Water molds came back when formalin was stopped during eyed stage





## Practice #2: step-by-step solution for perch ribbon

- **Effective dose:** 100 – 200  $\mu\text{L}/\text{L}$  formalin
- **Effective time:** shut the water off for 15 min, then turn it on
- Deliver formalin evenly or **dilute stocking solution**
- 25-50  $\mu\text{L}/\text{L}$  for eyed stage



## Practice #2: step-by-step solution for perch ribbon

### ➤ Alternatives

- Hatching rate of 1000  $\mu\text{L/L}$  hydrogen peroxide treatment was 100%

Aquaculture 165 (1998) 11–25

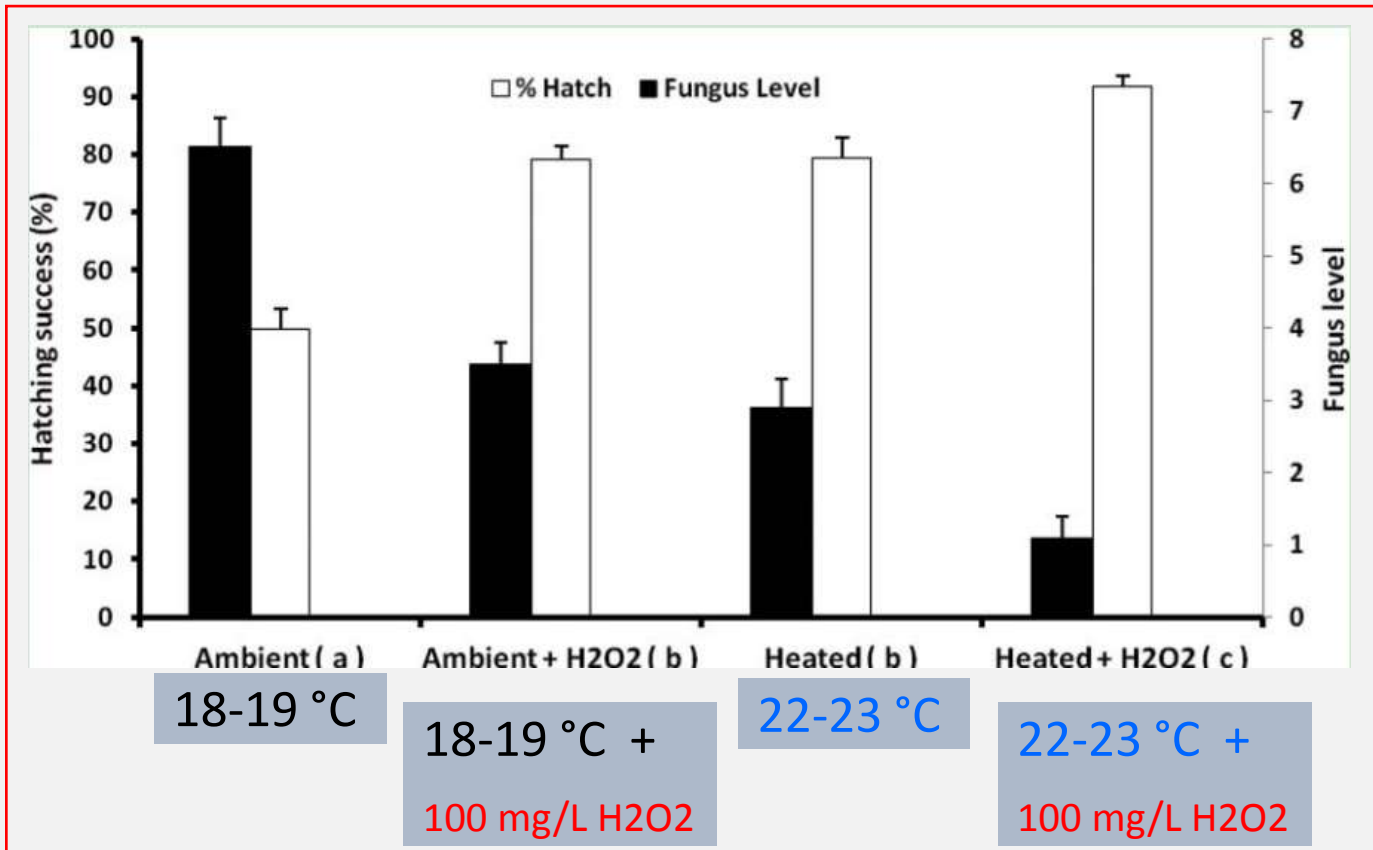
- Increase temperature gradually to 19 °C

## Practice #3: some other species – largemouth bass

- 100-150 mg/L free iodine for 15 min
- 500-1000 mg/L formalin for 15 min  
(The Progressive Fish-Culturist, 37:4, 213-217, 1975)



## Practice #3: some other species – largemouth bass



1. Increase water temperature to 22-23 °C
2. Add 100 mg/L hydrogen peroxide twice daily to the water inlet
3. both

High temperature

- accelerate egg hatching
- suppress pathogen growth

(North American Journal of Aquaculture 74:463–467, 2012)

## Practice #3: some other species – channel catfish

- 400 mg/L formalin

(Journal of Applied Aquaculture, 3:3-4, 269-278, 1994)



- 70 mg/L hydrogen peroxide

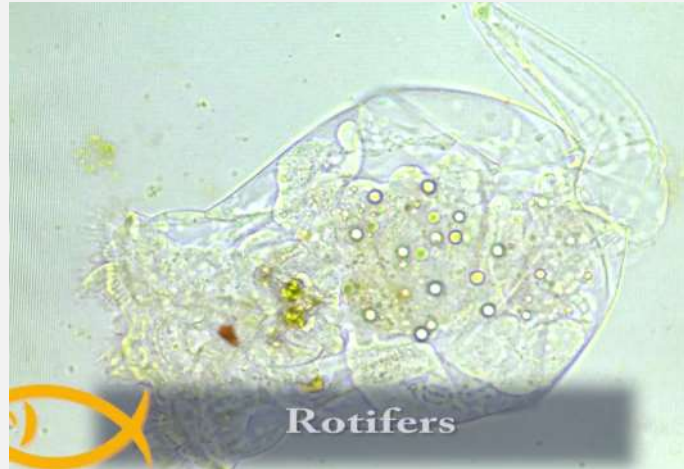
(North American Journal of Aquaculture 65:314–317, 2003)

- 2.5 ppm Peracetic acid - stabilized mixture containing acetic acid and hydrogen peroxide (USDA-ARS)



# Live feeding

- Rotifer  
160  $\mu\text{m}$



- Artemia  
428 / 486  $\mu\text{m}$

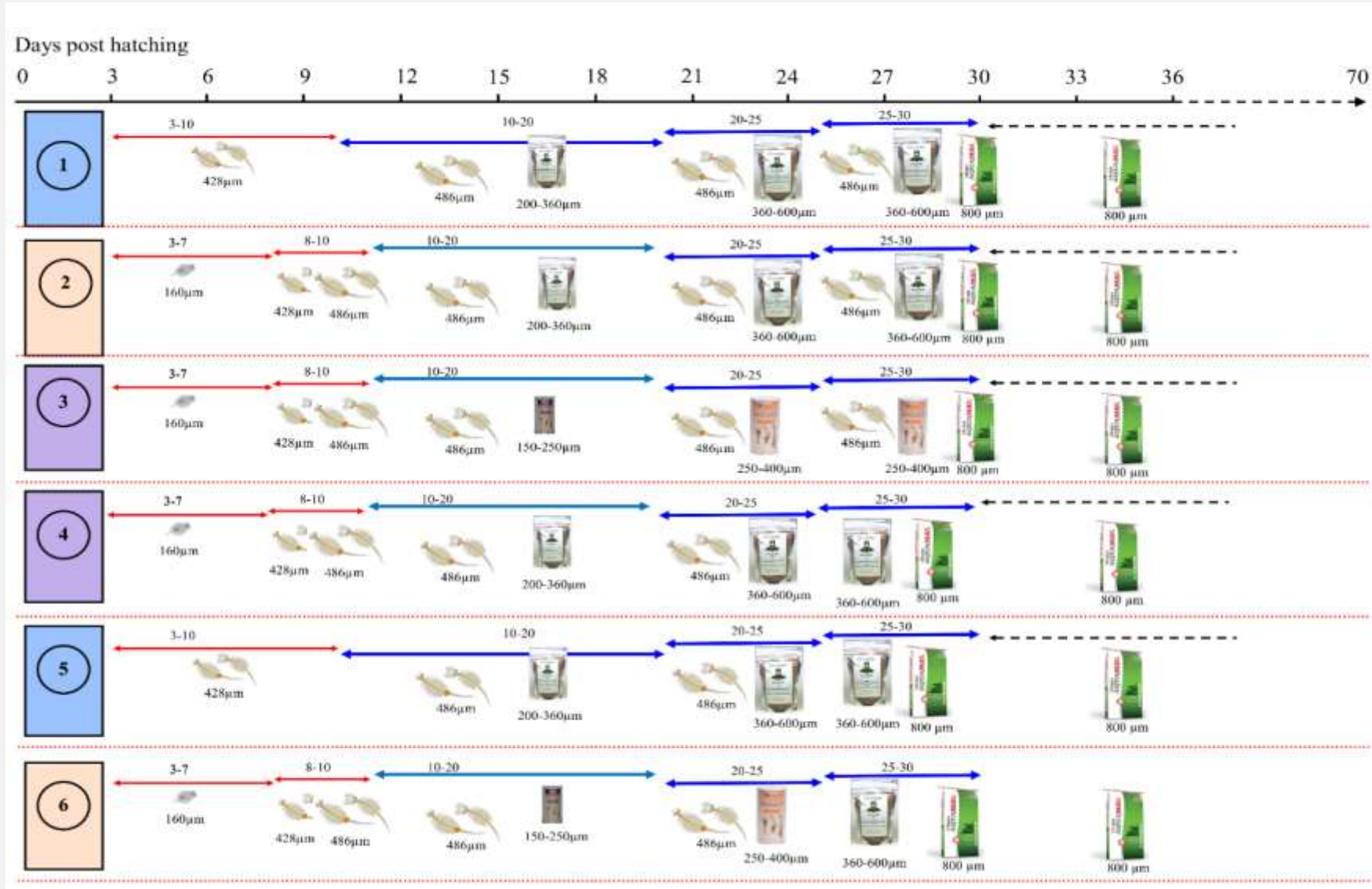


# Live feeding for yellow perch



- Small mouth gape
- Digestive system fully developed until 30 DPH

# Live feeding for yellow perch



- Rotifer
- Small Artemia
- Large Artemia
- Zeigler
- Otohime
- Starter feed

# Best regimes identified

1	3-7 dph	5-10 dph	8-20 dph	21-30 dph	30-45 dph	45-55 dph	55-
	Rotifer 160 µm	small artemia 428 µm	Regular artemia + Otohime B1 + AP100- 150	Regular artemia + Otohime B2 + AP100- 150 + AP150-250	Regular artemia + B2 + AP250-450 + Starter	B2 + AP250- 450 + Starter	Starter
2	3-10 dph	8-20 dph	21-30 dph	30-45 dph	45-55 dph	55-	
	Small artemia 428 µm	Regular artemia + Otohime B1 + AP100- 150	Regular artemia + Otohime B2 + AP100- 150 + AP150-250	Regular artemia + B2 + AP250-450 + Starter	B2 + AP250-450 + Starter	Starter	

Thanks for your attention!

Enjoy the hands-on training thereafter!

Aquaculture will feed the world!