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
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.

- 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
- Replace or disinfect old inlet pipes

Life cycles of digeneans infecting fish
Philosophy #3: prevention is the best strategy (2) - proper management

• Your memory has a capacity, please take a note
Philosophy

- Disease is the result 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?

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 (µL/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

Efficacy of formalin, iodine and sodium chloride in improvement of egg hatching rate and fry survival prior to the onset of exogenous feeding in yellow perch

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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

![Graph showing the effect of Formalin on different stages of development.](image)
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 µL/L formalin
- **Effective time:** shut the water off for 15 min, then turn it on
- **Deliver formalin evenly or dilute stocking solution**
- **25-50 µL/L for eyed stage**
Practice #2: step-by-step solution for perch ribbon

- Alternatives
  - Hatching rate of 1000 µL/L hydrogen peroxide treatment was 100%
  - 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

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

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

• Rotifer
  160 μm

• Artemia
  428 / 486 μm
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

<table>
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<th>3-7 dph</th>
<th>5-10 dph</th>
<th>8-20 dph</th>
<th>21-30 dph</th>
<th>30-45 dph</th>
<th>45-55 dph</th>
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<tr>
<td>1</td>
<td>Rotifer</td>
<td>160 µm</td>
<td>small artemia</td>
<td>428 µm</td>
<td>Regular artemia + Otohime B1 + AP100-150</td>
<td>Regular artemia + Otohime B2 + AP100-150 + AP150-250</td>
<td>Regular artemia + B2 + AP250-450 + Starter</td>
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<tr>
<td>2</td>
<td>Small artemia</td>
<td>428 µm</td>
<td>Regular artemia + Otohime B1 + AP100-150</td>
<td>Regular artemia + Otohime B2 + AP100-150 + AP150-250</td>
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</table>
Thanks for your attention!

Enjoy the hands-on training thereafter!

Aquaculture will feed the world!