Non-Infectious Diseases

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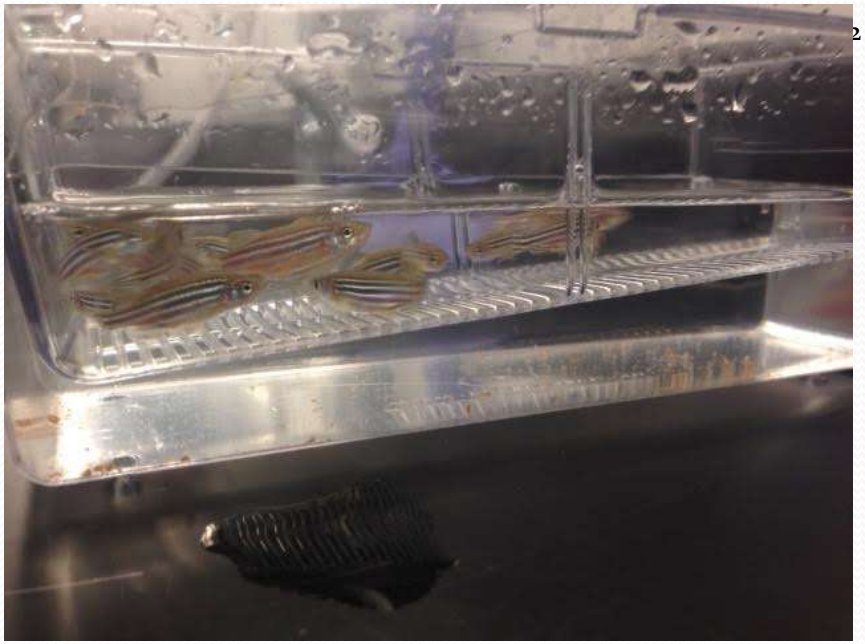
Water Quality

- Lack of oxygen
  - Respiratory distress

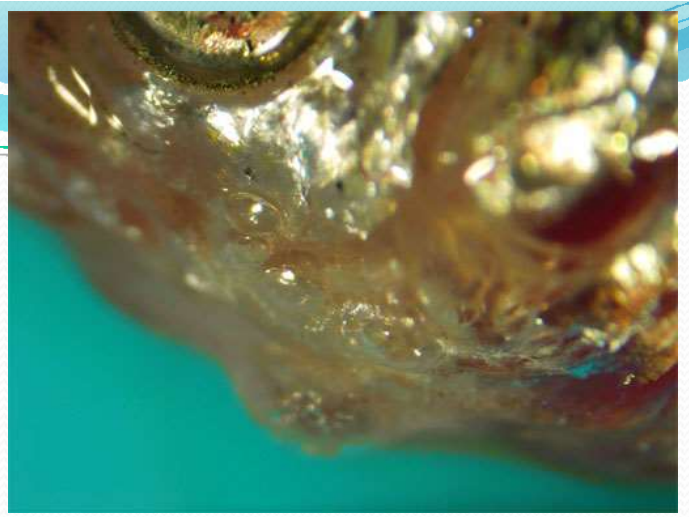
- Inadequate hardness
  - Embryo/larval mortality



Gas Supersaturation

- **Partial pressure of dissolved gasses in balance with PP of same gases in air (N_2, O_2, AR, CO_2)**
- **Air leak in piping suction side of pump***
- **Low water levels causing a vortex in sump**
- **Air injection into the system**
- **Gas dissolved in the water in excess of equilibrium results in supersaturation**
  - **Primarily N_2**
- **Excess gas will be released from solution**

Gas Bubble Disease



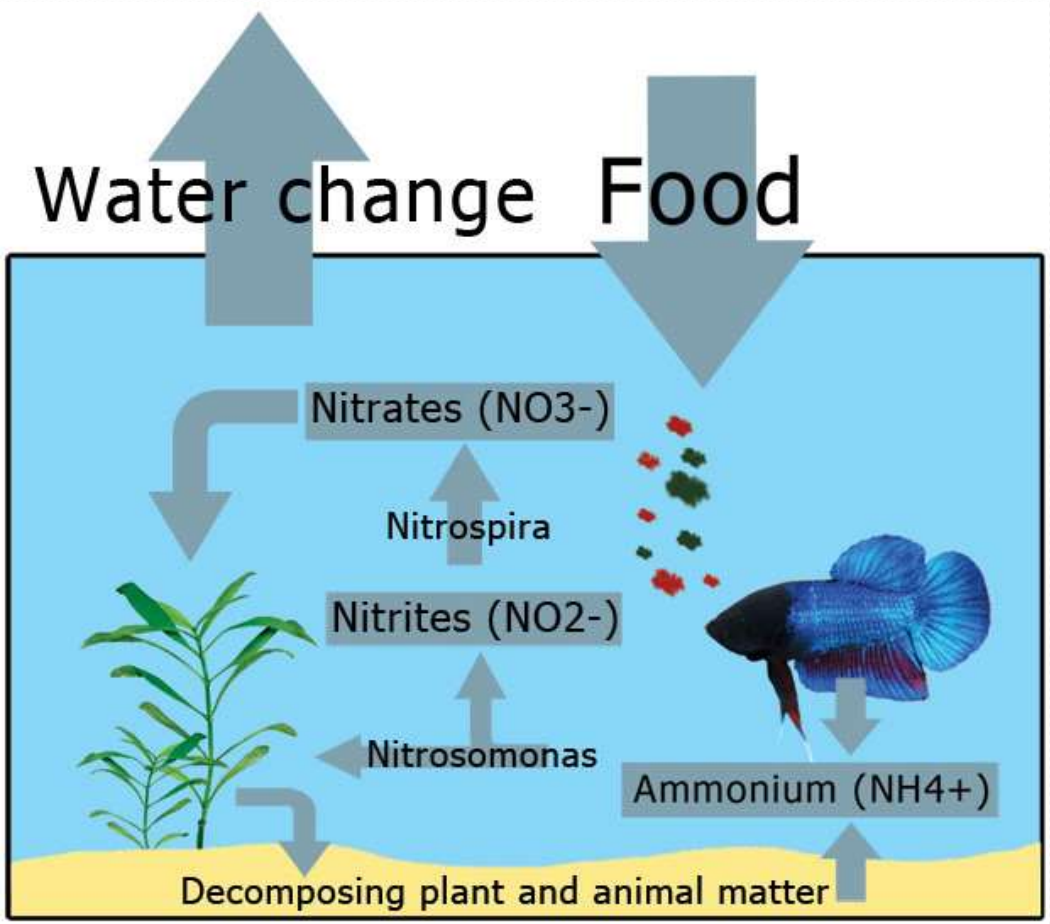
- **Fish tissues become supersaturated with gasses, which are released as bubbles causing tissue damage**
- Bubbles
- Buoyancy problems
- Hemorrhage
- Death

DX: Fish on low or no water flow are ok
Check TDG

GBD Treatment

- Stop the pumps!
  - Stop feeding
  - Turn off UV light
- Find the problem
- Maintain water quality without water flow
- Susceptible to secondary infections, negative impact on breeding*

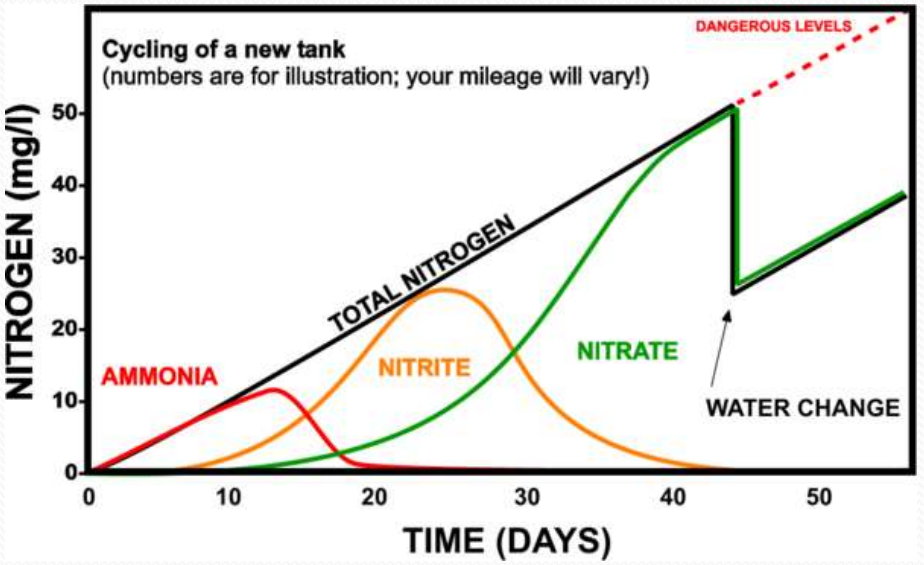
Nitrogenous Waste Toxicity



http://www.fnzas.org.nz/wpcontent/uploads/2011/05/NitrogenCycle3.jpg

Nitrogenous Waste Toxicity

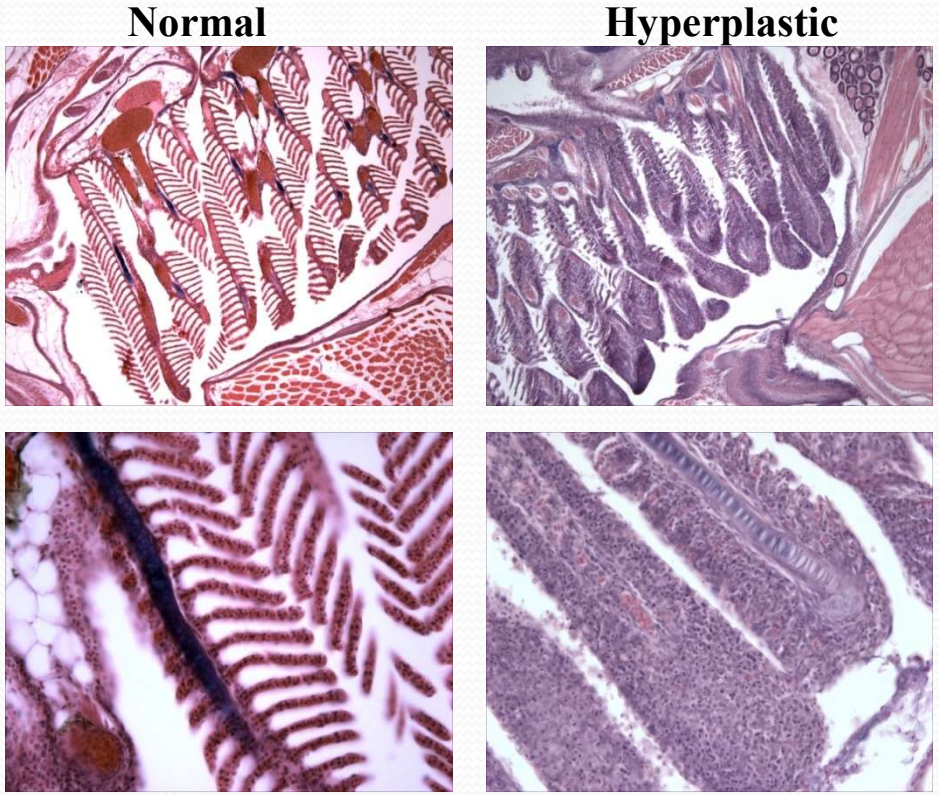
- Ammonia (NH_3): > 0.02 ppm (mg/L)
  - pH/temp impact
- Nitrite: > 0.5-1.0 ppm
- Nitrate: > 200 ppm
- Diagnosis: Water sample



https://www.theaquariumwiki.com/Beginning_Fishkeeping-Cycling_Your_Tank

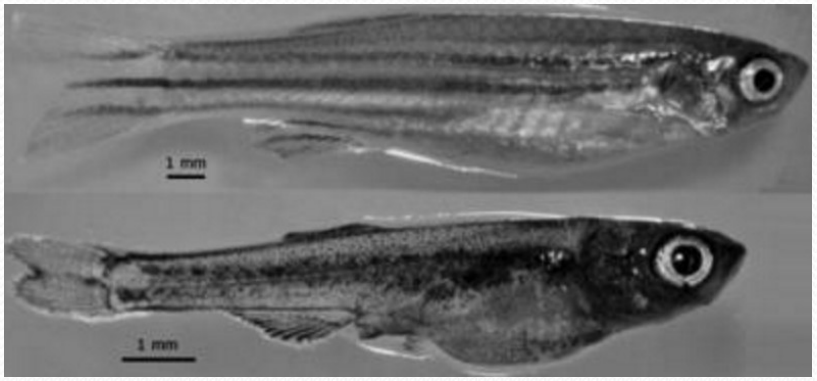
Ammonia & Nitrite Toxicity

- Ammonia and Urea transporters heavily concentrated in gills
- Physiologic response is age dependent
  - Embryos and Larva more tolerant
- Toxicity influenced by other water parameters



Acute Toxicity

- Behavioral changes
- Respiratory distress
  - Gasping at water surface
  - Lethargy
  - Hemorrhage
- Death



Nitrate > 400ppm; Learmonth 2015

Sub-acute/Chronic exposure

- Sub-lethal levels
- Reduced growth
- Decreased breeding success
- Stress
  - Immunosuppression
  - Disease (bacterial, fungal, etc.)
  - Death

Courtesy of George Sanders

Treatment

- Treatment: Correct values GRADUALLY!
- Improve water flow- slowly! Watch pH!
- Reduce fish densities
- Stop/decrease feedings

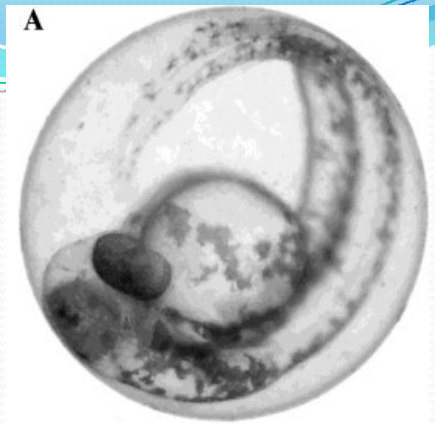
PREVENT IT!

- Add fish to systems gradually
- Don't over feed
- Regular water exchange

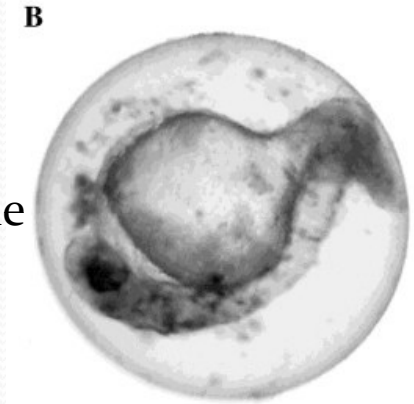
Other Toxins

- Heavy Metals
  - Copper: Delayed hatching & neurologic signs
  - Lead: Neurotoxicity
- Medications
  - Sensitive- tox study model!

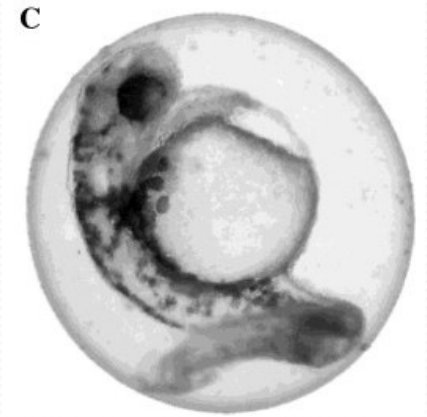
Control



Fenbendazole



Febantel



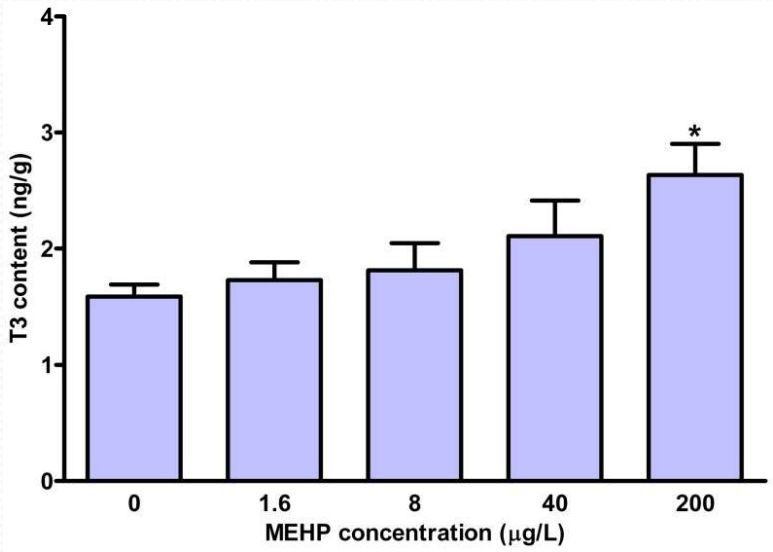
Carlssona, Gunnar, et al

Chemicals/Toxins

- Chlorine
  - Very sensitive
- Cleaning products
- Gloves
  - Toxicity to latex demonstrated
  - Avoid powdered gloves

Plasticizers

- Plasticizers
  - Fry are much more sensitive
  - Caution with new systems and enrichment
  - Thyroid endocrine toxicity
  - Disturbance of spermatogenesis
  - Induce genetic aberrations



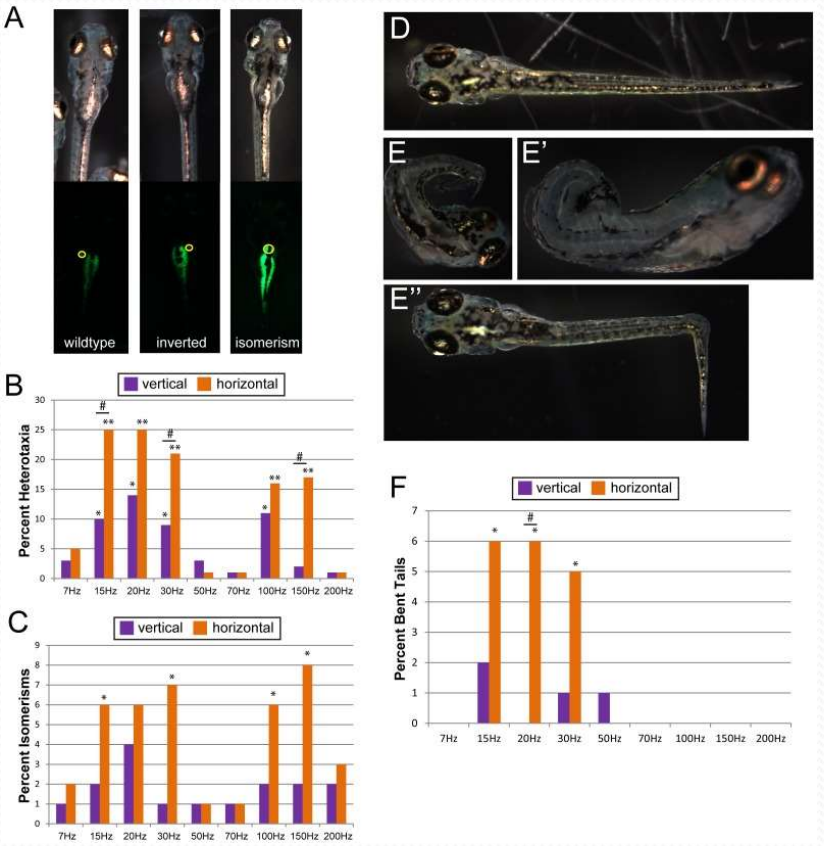
Zhai, 2014

Lighting

- Light
  - Altered rhythms impact activity and spawning
    - Routine monitoring of room lighting
  - Exit signs
    - Control group spawned twice as many embryos compared to those housed in front of a red EXIT sign
    - Green EXIT sign showed no difference
  - Other light producing equipment

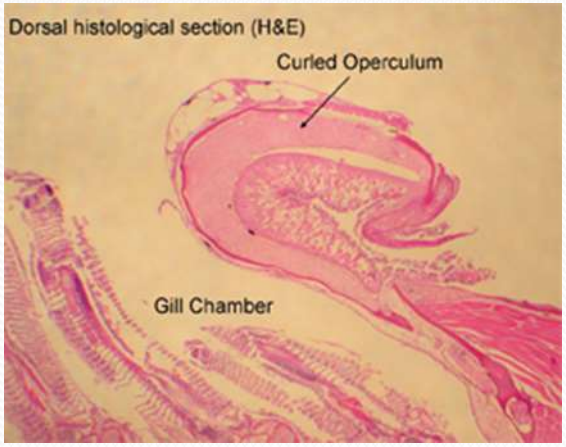
Vibrations

- Low level vibrations
  - Altered left-right patterning and tail morphogenesis
- Continuous vibrations
  - Lowered total activity levels
- Death in other aquatic species



Vandenberg, 2012

Is this a problem?



ZIRC

Iatrogenic

- Handling
  - Net catching
  - Egg stripping
    - Dermal abrasions
- Enrichment?
- Experimental
  - Compound administration
  - Behavioral testing devices

Breeding Practices

- Eggs develop in females regardless of male presence
  - Food availability
  - Water quality

Egg-Associated Inflammation (EAI)

- Likely caused by egg retention
  - Usually present with abdominal distention
  - Incidence seems to increase with age

- Sequela
  - Secondary Infections*
  - Aggressive fibroplasia
  - Poor breeder

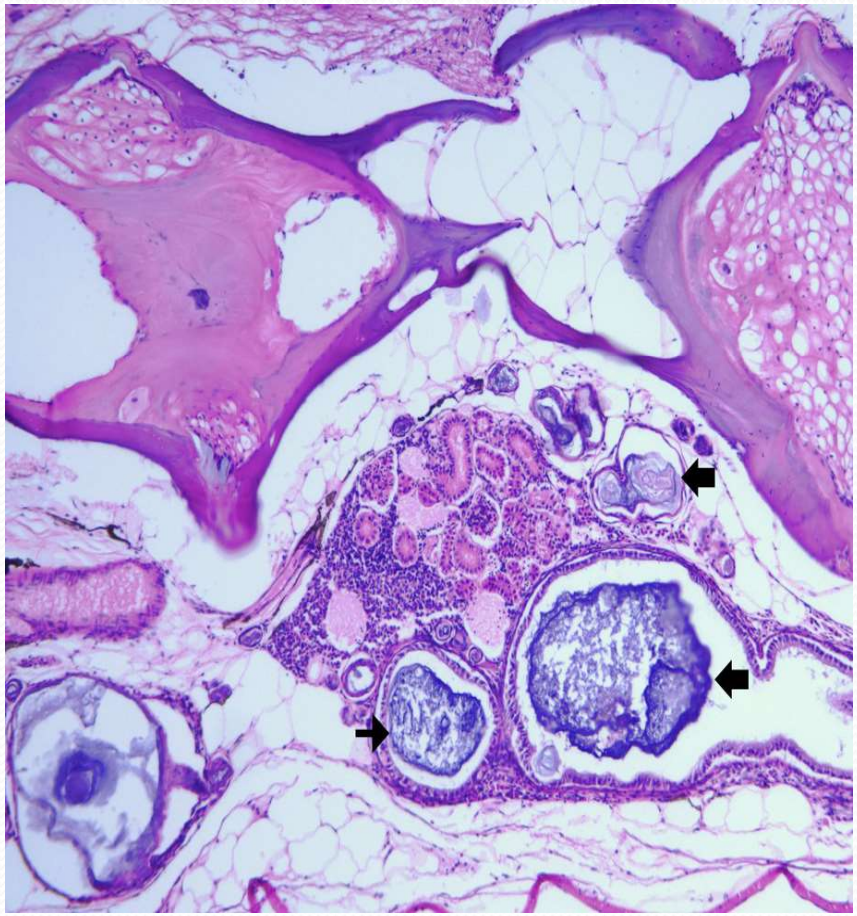
ZIRC


0 cm
1
2
3

Egg-Associated Inflammation

- Prevention:
  - Timely spawning of females
  - House males and females together
  - Retire fish appropriately

Nephrocalcinosis



- Subclinical
- High CO_2
  - Associated with crowding
- Use of calcium carbonate
  - Recommended buffering with sodium bicarbonate
- Excessive dietary Ca
- Dietary Magnesium
- Selenium toxicity

Hepatic Megalocytosis

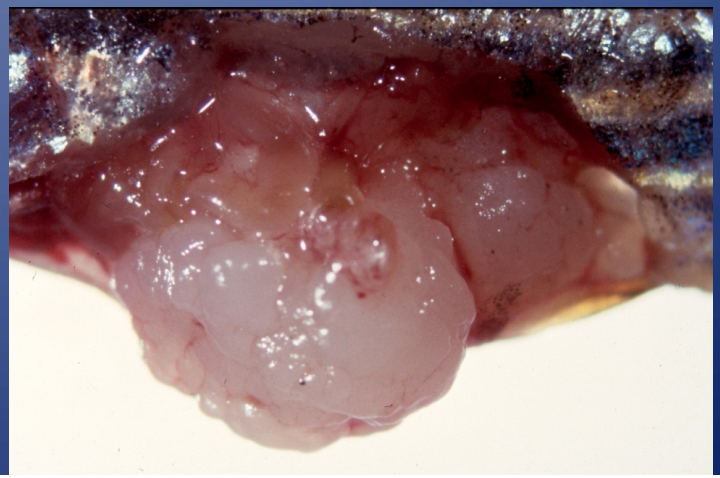
- Enlargement of hepatocyte nuclei and cytoplasm
- Not associated with progression to neoplasia
- Thought to be caused by hepatotoxicants
  - Dietary
  - Algal, etc.
  - Carcinogens
  - Unknown direct cause
- Cells are polyploid (failure of cell division)

Neoplastic Disease

- Reported in nearly every organ
  - Most cell types
- Liver most common target organ for carcinogens*
  - Liver grows throughout life
- Reproductive organs
- Ultimobranchial neoplasia
- Brain, eye, spinal cord
- Not so common:
  - Epithelial
  - Melanoma
  - Liposarcoma
  - Heamtopoeitic

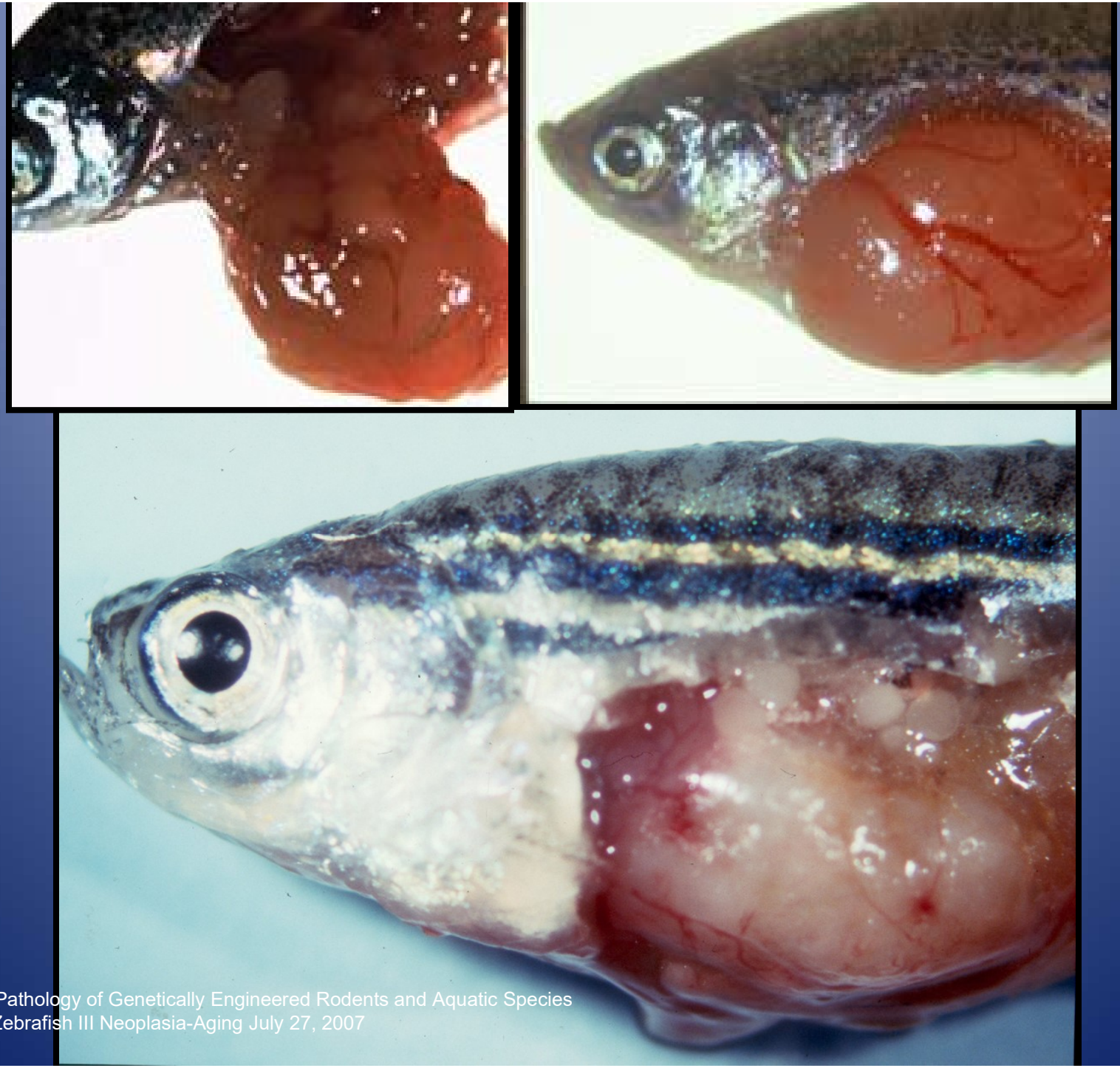
Seminoma

- Most commonly reported spontaneous neoplasm of Zebrafish*
- Can become extremely large (up to 50% of body mass)
- Most are extremely well-differentiated
- Not reported to metastasize



Hepatic Neoplasia

- Hepatocellular adenoma or carcinoma have been the most commonly observed
  - +/- carcinogen exposure
- Cholangiocarcinoma and mixed also seen
- Soft white to tan masses that may be single or multiple
  - May bulge above the surface



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ZIRC

THE END

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