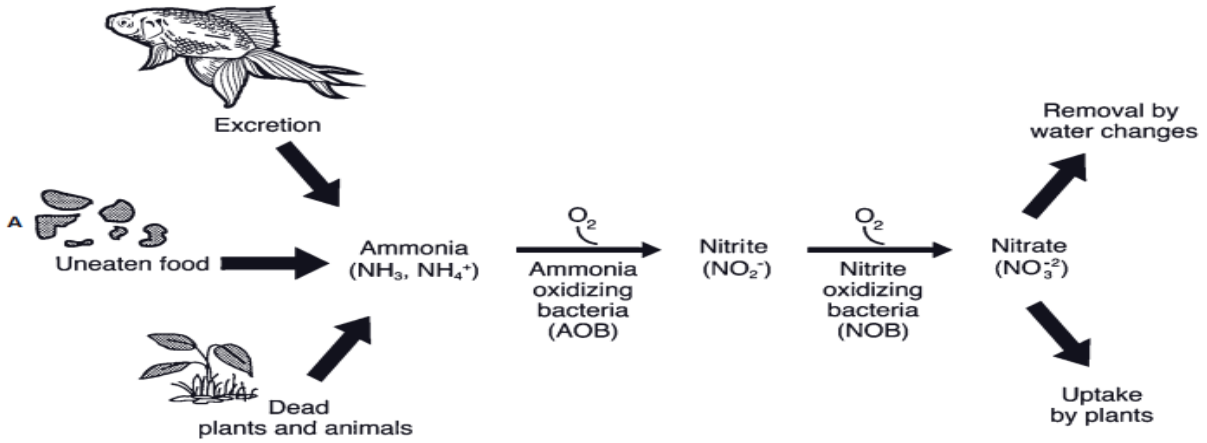
Lecture title:



Toxicity of ammonia to fish will depend on various factors:

The species of fish; the exposure level of free ammonia; the period of exposure, and any previous acclimation effects (The proportion of ammonia present as the toxic free form increases with increasing water temperature and pH, but decreases with increasing salinity).

Causative agents of Ammonia poisoning:

1- Overcrowding
2- Recent medication or other chemicals added
3- Newly established aquarium; or aquarium recently washed
4- Failure of biological filters
5- reduced water flow in raceway

Pathological Mechanisms

High aqueous ammonia **increases** blood and tissue ammonia levels, causing **elevated** blood pH, osmoregulatory **disturbance**, **increased** tissue oxygen consumption, and **decreased** blood oxygen transport

Clinical Signs and Gross lesions of Ammonia Poisoning

Acute ammonia

1- toxicity can cause behavioral abnormalities, including hyperexcitability
2- Fish often stop feeding.

Chronic ammonia

1- Hyperplasia and hypertrophy of gill tissue
2- Fin damage, the edge of fin destroys and appear as cooked like fin.
3- Increase mucus production over the gills

Diagnosis

Ammonia problems can be easily checked using a test kit(e.g. colorimetric assay)

Treatment

(A) AQUARIA

1. 25 – 50% water change (daily to weekly, depending on ammonia concentration)

2. Add zeolite

3. Add nitrifying bacteria

4. Add biological filtration

5. Decrease density

6. Temporarily reduce or stop feeding

(B) PONDS, FLOW - THROUGH SYSTEMS

1. Stop or reduce feeding

2. Decrease density

3. Add water or increase water flow

Nitrite Poisoning

(Brown Blood Disease, New Tank Syndrome)

It is mean increase nitrite concentration in the water environment

The causes for this environmental disease

1- Ammonia poisoning
2- In a newly aquarium (insufficient Nitrobacter bacteria present to convert nitrite into nitrate)

Toxic mechanisms of nitrite

Fish that are exposed to nitrite absorb this chemical across their gills and into the blood. Within the blood, nitrite oxidises the respiratory pigment (haemoglobin) into methaemoglobin, which is far less efficient in carrying oxygen to the tissues. This results in **hypoxia** and respiratory stress

Methemoglobin concentrations of 25 – 30% usually give the blood a slightly brown color, but MetHb concentrations must usually be around 40% to cause grossly visible chocolate brown blood and pale tan to brown gills

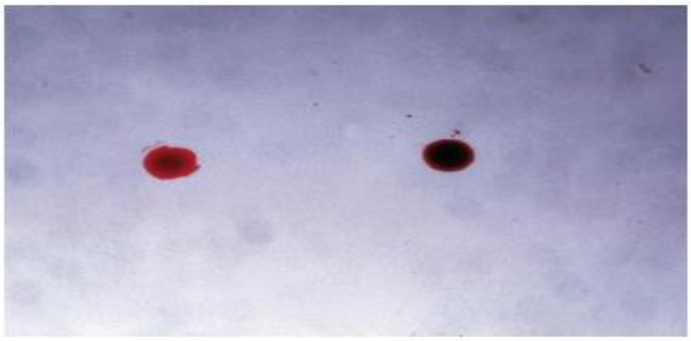


Fig. II-5. Normal drop of blood (left) and blood with high concentration of methemoglobin or brown blood (right).

Clinical Signs

1- Behavioral changes noted with nitrite poisoning are characteristic of hypoxia,
2- Fish was lethargy and swimming near the water surface.
3- Nitrite poisoning may cause acute mortality
4- Nitrite is also a smooth muscle relaxant and vasodilator
5- Fish with anemia may also have pale/ light tan to brown gills
6- Fish with severe (i.e., 80% or greater) methemoglobinemia are dyspneic even with adequate oxygen.
7- Tan to brown blood

Figure 3.20 Darker appearance of gills due to methemoglobinemia.

Figure 2.10 Nitrite toxicity in channel catfish (*Ictalurus punctatus*) showing darker discoloration of gill tissue in affected fish (lower) compared to red gill tissue of normal fish (upper). (Image courtesy A. Mitchell.)

Treatment

(A) AQUARIA

1. Twenty - five to 50% water change (daily to weekly, depending on nitrite concentration)

2. Add nitrifying bacteria

3. Add chloride

4. Enhance biological filtration

5. Decrease density

6. Reduce temperature

7. Reduce feeding

(B) PONDS

1. Add chloride (least 3 mg chloride to 1 mg nitrite)

2. Maintain highest DO possible