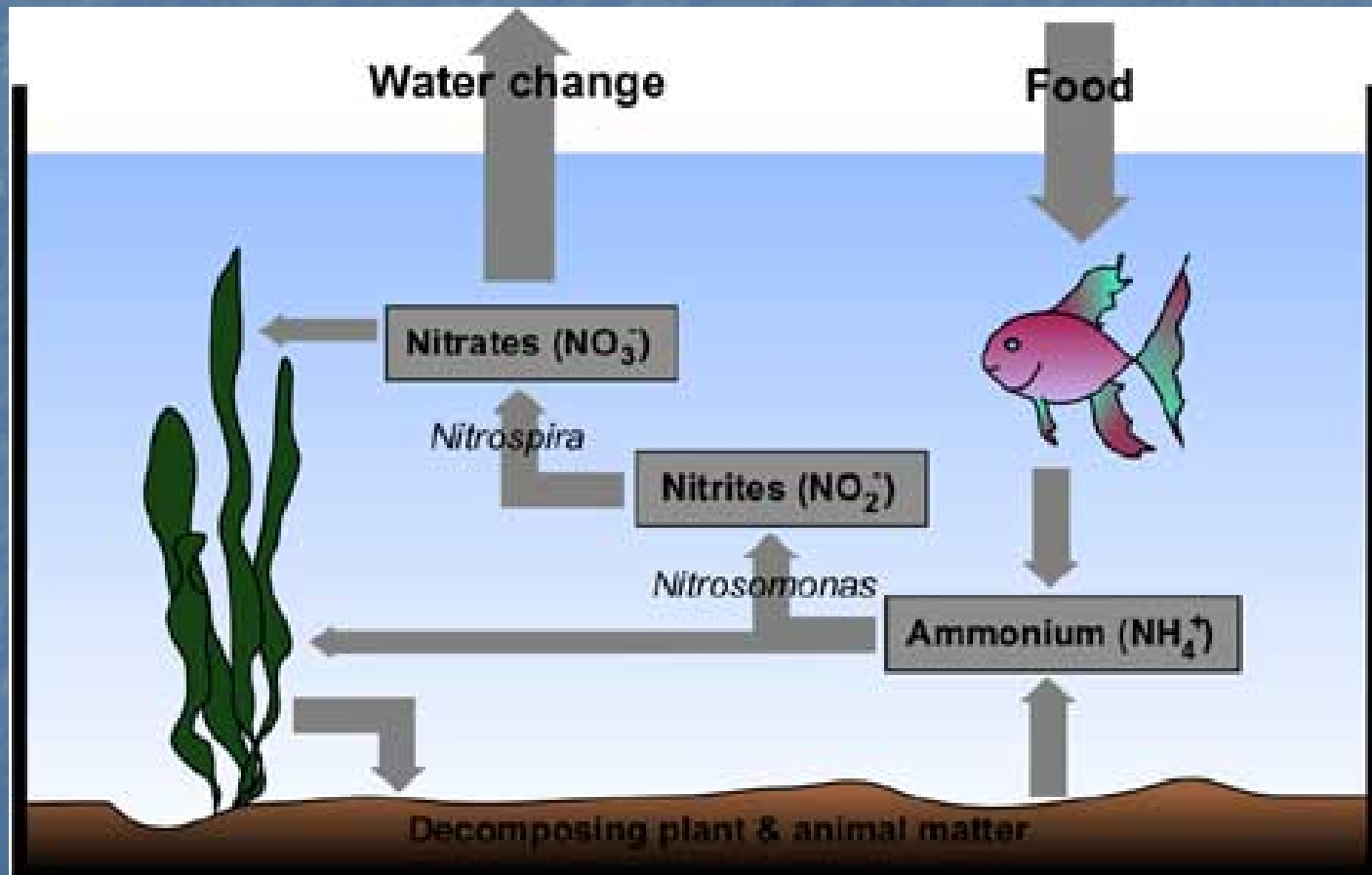


# The Nitrogen Cycle



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# The Nitrogen Cycle

Call it cycling, nitrification, biological cycle, startup cycle, break-in cycle, or the nitrogen cycle. No matter what name you use, every newly set up aquarium goes through a process of establishing beneficial bacterial colonies.

## The Waste Problem

Unlike nature, an aquarium is a closed environment. All the wastes excreted from the fish and uneaten food stay inside the tank. If nothing eliminated those wastes, your beautiful trout tank would turn into a poison tank for your trout.

Fortunately, since we start with eggs, we have time to get the tank ready to handle the waste produced by the fish after the eggs hatch

# Nitrogen Cycle Stages Summary

- Stage 1: Ammonia (toxic to fish)
  - Created by fish waste and/or dead fish
  - Not removing uneaten food
- Stage 2: Nitrites (toxic to fish)
  - Bacteria (*Nitrosomonas*) oxidizes the ammonia
- Stage 3: Nitrates (not as harmful)
  - Bacteria (*Nitrobacter*) convert Nitrites to Nitrates
  - Nitrates removed with gravel cleaning and water changes

# The Nitrogen Cycle – Stage 1

The cycle begins when the eggs hatch and start producing waste. Fortunately, just after hatching the alevins are producing very little waste. Their waste is quickly broken down into either ionized or unionized ammonia. The ionized form, Ammonium ( $\text{NH}_4$ ), is present if the pH is below 7, and is not toxic to fish. The unionized form, Ammonia ( $\text{NH}_3$ ), is present if the pH is 7 or above, and is highly toxic to fish. Any amount of unionized Ammonia ( $\text{NH}_3$ ) is dangerous. To introduce the beneficial bacteria, as the eggs hatch we start adding BioZyme, a product that contains both Nitrosomonas and Nitrobacter bacteria.

# The Nitrogen Cycle – Stage 2

During this stage Nitrosomonas bacteria in the BioZyme oxidize the ammonia, thus eliminating it. However, the by-product of ammonia oxidation is nitrite, which is also highly toxic to fish. Nitrites levels as low as 1 mg/l can be lethal to some fish.

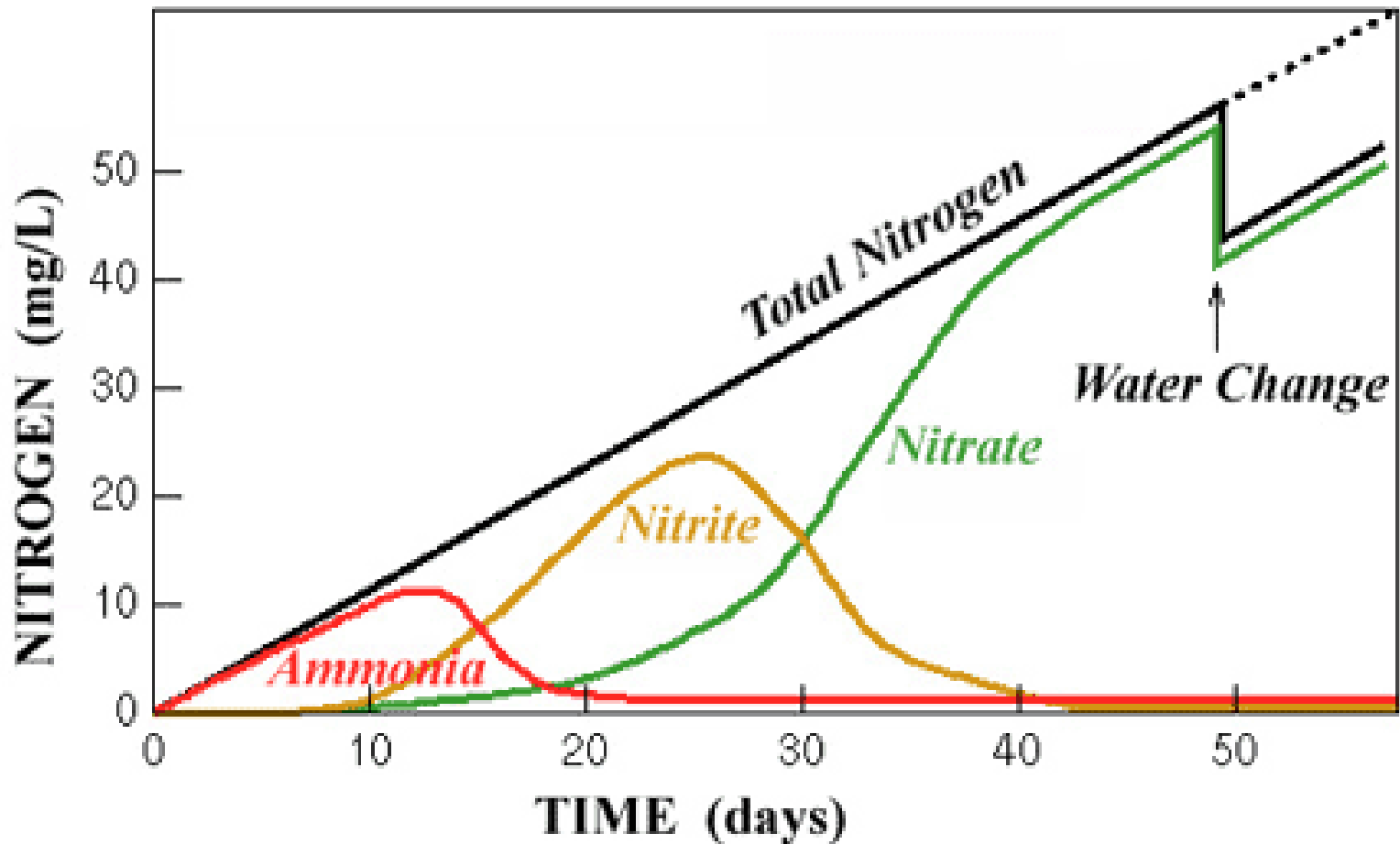
# The Nitrogen Cycle – Stage 3

In the last stage of the cycle, Nitrobacter bacteria convert the nitrites into nitrates. Nitrates are not highly toxic to fish in low to moderate levels. Routine water changes (10% to 20% a week) will keep the nitrate levels within the safe range. Ammonia levels should be very close to or at zero by this stage.

# The Beneficial Bacteria

Nitrosomonas and Nitrobacter bacteria are slow growing surface dwelling bacterial. You can't see them, but they live on the filter sponges and lava rock. The number of bacteria in the tank is dependant on the amount of ammonia being produced by your fish. Once stabilized, the colony size will continue to expand if more ammonia is present. But because they are slow growing, it takes time for your tank to reach the third stage of the Nitrogen cycle.

# Water Quality: Nitrogen Cycle



# Prevention starts when you get your eggs

The white eggs will not hatch and must be removed. Otherwise they will decompose and add to the ammonia problem



# Unexplained Death

- o Dead fish and uneaten food are not always noticeable. They could drift down and be hidden in the rocks or sucked up into the filter.
- o Make it a point to follow the recommended gravel, pre-filter and filter, water change schedules.
- o A rise in your Ammonia level will be your only clue before your fish start dying.



# Conclusion

- Monitor and record the water quality daily
- Change 10% - 20% of the water weekly
- Have Fun!