An introduction to fishless cycling

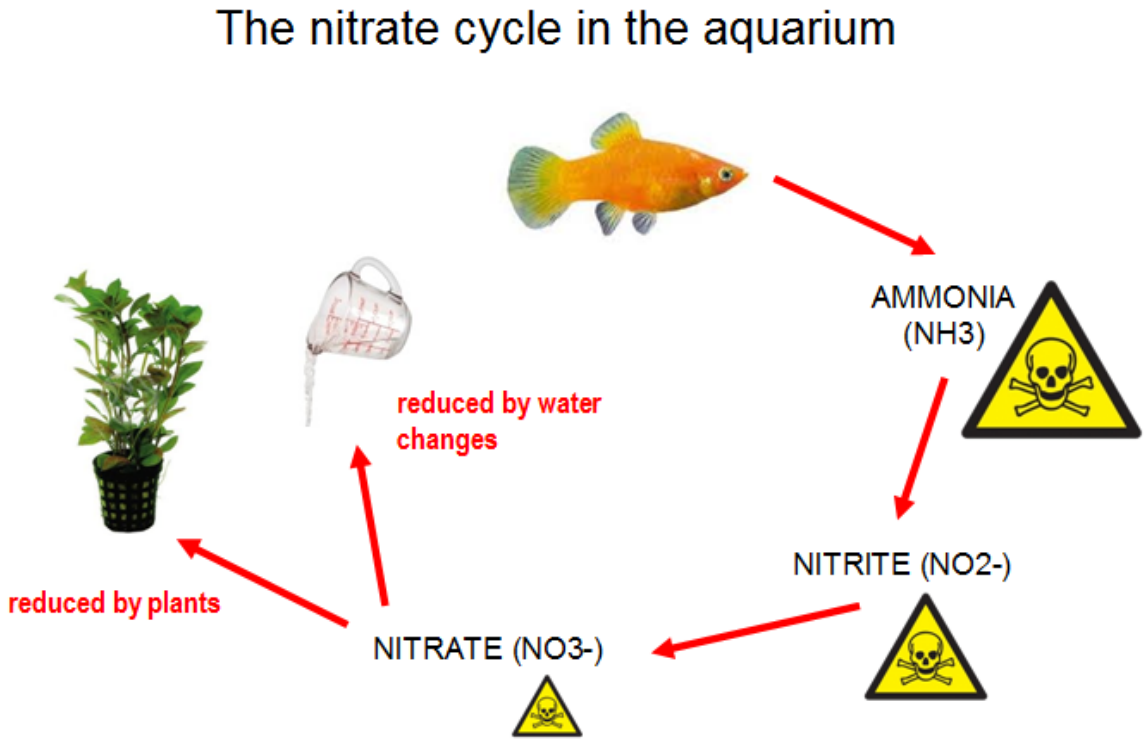
If you are setting up a new aquarium, it is essential that you prepare the conditions before you add your fish. Unfortunately, not all pet shop recommendations are adequate to achieve this safely. This guide is a starting point to help set up your aquarium with the health and welfare of your fish in mind. The cornerstone in all freshwater fishkeeping is understanding the nitrate cycle.

An overview of the nitrate cycle

The main waste product of any aquarium is **ammonia**. This is present in fish faeces and released from uneaten fish food. Ammonia is highly toxic to fish, leading to death throughout the tank if it is not removed. Ammonia poisoning is probably the most common cause of illness and death in aquarium fish.

In the mature tank, ammonia is quickly converted into **nitrites** by friendly bacteria. Nitrites are less toxic than ammonia but are still dangerous, and can cause 'brown blood disease' and death in aquarium fish.

Luckily, in the mature tank the nitrites are converted by the friendly bacteria into **nitrates**, thus completing the nitrate cycle. Nitrates are still harmful at high concentrations, but levels can be kept under control by regular water changes and absorption by aquarium plants.



It is essential to recognise that the nitrate cycle cannot proceed without the presence of the friendly bacteria in the tank. These nitrogen-fixing and nitrifying bacteria take time to build up and will NOT be present when you first set up your aquarium.

If you add fish before the bacteria are present, the nitrate cycle will start but not be able to finish. Ammonia levels will build up and kill your fish!

How to measure water levels of ammonia, nitrite and nitrate

The best method is via one of the commercial water testing kits, such as the API Freshwater Master Kit (other brands are available). They are safe and simple to use - just collect a sample of water from your tank, add the test solution according to the instructions and read the result using the colour charts provided. You can also purchase dipstick tests, but these don't tend to be as reliable as the solution-based tests.

How to set up an aquarium using fishless cycling

1. Do not be tempted to add your fish too soon. The pet shop may tell you to leave the tank to 'settle' for a few days, but this is not enough. To completely cycle a new aquarium can take several weeks, so time and patience are invaluable.

2. Start by setting up your aquarium, including substrate, plants, decorations and dechlorinated tap water, and get the filter running 24/7.

3. To kick-start the nitrate cycle, an ammonia source must be added to the tank. You can use fish food or specialist aquarium products, but it is often easiest to use simple 9.5% household ammonia. This is available in the cleaning section of most DIY stores and is not expensive. Make sure the room is well ventilated when you add it to the water as the smell of ammonia is pungent, and always take care when handling liquid ammonia. Start by adding ammonia to the tank - a rough guide is 1ml ammonia per 25L of water in the tank. At first you want to achieve an ammonia level of about 4ppm (parts per million - as measured on your water test kit).

4. Measure the ammonia, nitrite and nitrate levels daily. Eventually the ammonia levels will start to drop - top up ammonia as necessary each time to maintain the water level at 4ppm. The water may turn cloudy as bacteria begin to multiply - this is normal and will clear in time.

5. Adding exogenous bacteria, such as Tetra SafeStart (other brands are available), after a few days can help speed up the process by boosting the bacterial population in the aquarium.

6. At first the nitrite level will be 0ppm, but eventually it will start to climb. This will usually happen 1-2 weeks after starting the cycle. You should see the nitrite levels increasing to around 2-4ppm as the ammonia levels gradually drop to 0ppm. Keep adding ammonia to ensure you are supplying the bacteria in the cycle.

7. You can stop testing and adding ammonia once you are getting consistent readings of 0ppm for both ammonia and nitrite each day. Nitrate levels will never reach 0ppm – there are some present in tap water and the cycle will continue to produce some. You should aim for a nitrate level of 40ppm or less.

Once the cycling is complete, you will need to control nitrate levels with regular water changes (at least every two weeks). Aquarium plant life will also help to reduce nitrate levels.

Lots of useful information on fishless cycling can be found at www.practicalfishkeeping.co.uk