Nitrate Removal Options for Complete Nitrification

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say NO to NO_3

Does your aquarium perfectly replicate the natural world? Serious home aquarists have long strived to mimic nature with everything from décor to filtration systems to the food that is fed to their fish, plants, or corals. Oftentimes, this dedication extends to diligent control of the aquarium's nitrogen cycle. However, one often-elusive component of even the most advanced aquarium system is complete nitrification.

→ Complete nitrification defined

The nitrogen cycle is responsible for your aquarium's biological filtration and, ultimately, the removal of toxins. Within this cycle, bacteria and fungi break down uneaten food, dead organisms, and fish, plant, and invertebrate waste into ammonia. Aerobic bacteria, which need oxygen to survive, then break down ammonia into nitrite, and nitrite into nitrate. For most aquarists, nitrate is then removed from the system by frequent water changes.

> **Q:** I cannot stop algae blooms in my reef aquarium. What could be the culprit?
>
> A: High nitrate levels often encourage algae growth. In fact, levels as low as 5 ppm or less can cause algae blooms in the reef aquarium with intense lighting.

However, nature and more elaborate aquarium filtration systems continue to further break down nitrate. Within this stage of the nitrogen cycle, another bacteria set converts nitrate into nitrogen gas, which is then released at the water's surface and absorbed into the air. This natural process of nitrate removal from your aquarium is known as complete nitrification or de-nitrification.

The conundrum of complete nitrification, however, is that the process relies on special bacteria to convert nitrate into free nitrogen. These bacteria require low-oxygenated, stagnant water to survive. In fact, the oxygen-rich water of most aquariums and filtration systems creates a deadly environment for these essential denitrifying bacteria.

→ The importance of complete nitrification

Your aquarium's nitrogen cycle is fragile. Added livestock, unnoticed aquarium deaths, overfeeding, medication, and system maintenance can stress the nitrogen cycle and allow rapid toxin buildup. Furthermore, though nitrate is less toxic than ammonia and nitrite, nitrate is not safe for your aquarium inhabitants.

In fact, nitrate causes stress to fish and invertebrates, which opens the door to diseases and reproductive failures. In addition, high nitrate levels can quickly change water chemistry in your aquarium and are often the source of serious algae blooms. Therefore, nitrate removal is vital to your aquarium's overall health.

→ Complete nitrification in your aquarium

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FRESHWATER

Control of nitrate and nitrogen cycle imbalances in freshwater aquariums relies on a multi-step approach. The easiest way to help foster complete nitrification is by keeping your aquarium clean. Routine water changes are vital to toxic waste removal and should be performed regularly, regardless of the filtration system you employ.

The addition of live plants will also help control nitrate. Nitrate and other nitrogenous compounds are vital for plant growth and aquatic plants will pull these chemical compounds from the water column. There are also chemical media that help detoxify nitrate, nitrite, and ammonia. Finally, products such as the Nitrate Reductor help create a low-oxygen chamber inside, beside, or in the sump of any aquarium to house bacteria that break down nitrate.

SALTWATER

Like freshwater systems, saltwater aquariums also require routine cleanings and water changes for the best nitrate and nitrogen cycle control. Beneficial macroalgae and chemical media also help reduce nitrate levels in your saltwater system. Skimmers can be particularly effective at helping prevent the formation of toxic chemical compounds, since they remove dissolved proteins from the water column. Refugiums can also be ideal locations for the growth of nitrate-consuming bacteria.

Possibly the simplest way to help control chemical toxins in your saltwater system is through the addition of live rock. In addition to being rich in biological diversity, live rock is unique in that it supports both nitrifying and denitrifying bacteria. Oxygen-loving nitrifying bacteria colonize on the rock's outer surface and aid in the nitrogen cycle. Within the live rock, in low-oxygen areas, denitrifying bacteria thrive to help consume nitrate and promote complete nitrification.

Recommended Products

Nitrate Reductor

AquaFuge External Hang-On Refugium

Drs. Foster and Smith Instant Ammonia Remover

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