

THE NITROGEN CYCLE

The pond nitrogen cycle for koi converts toxic fish waste (ammonia) into harmless compounds (nitrates) using beneficial bacteria, keeping water safe. It involves a three-stage biological process:

Ammonia production -- Nitrite formation - Nitrate conversion.

A functioning filter, proper aeration, and regular testing are crucial for a healthy ecosystem.

The Three Stages of the Nitrogen Cycle

1 - Ammonia Production (NH₃)

Koi excrete ammonia directly, and it is also produced by decaying uneaten food, feces, and organic debris (leaves). It is highly toxic.

2 - Nitrite Formation (NO₂)

Beneficial bacteria known as Nitrosomonas consume ammonia and turn it into nitrites. While less toxic than ammonia, nitrites are still harmful to koi.

3 - Nitrate Conversion (NO₃)

Nitrobacter bacteria convert the nitrites into nitrates. Nitrates are safe in low quantities and are absorbed by aquatic plants, removed via water changes, or removed by specialized filtration.

Key Components for Management

Biological Filtration: A properly sized filter provides surface area for Nitrosomonas and Nitrobacter bacteria to colonize.

Aeration: Nitrifying bacteria require high oxygen levels to thrive and convert waste efficiently.

Water Changes: Regular water changes (10-25%) are essential to dilute nitrates (the final stage) when they exceed 80 ppm.

Testing: Monitor levels weekly using test kits for ammonia, nitrite, and nitrate to ensure the cycle is stable.

Stocking Levels: Fewer fish mean less ammonia, which is safer for the ecosystem.

Common Pitfalls

New Pond Syndrome: New ponds lack enough bacteria, leading to lethal ammonia spikes.

Overfeeding: Increased waste leads to overloading the nitrogen cycle.

Overcleaning: Harsh chemical cleaners or washing filter media in tap water can kill beneficial bacteria