# BENEFICIAL MICROBIAL CULTURES

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**Introduction**

Clean-Water's Beneficial Microbial Cultures offer a powerful, natural solution for restoring water quality in various waterbodies, including lakes, ponds, reservoirs, and streams. These cultures consist of a diverse mix of beneficial bacteria specifically formulated to break down pollutants, control harmful nutrients, and balance the ecosystem. By reducing organic waste and controlling algae growth, Clean-Water's Beneficial Microbial Cultures support healthier aquatic environments, making them ideal for urban and rural waterbody restoration projects.

Key Features of Clean-Water's Beneficial Microbial Cultures:

1. **Targeted Nutrient Control:** The microbial cultures are designed to consume excess nutrients such as nitrogen and phosphorus, which often lead to harmful algal blooms. By reducing these nutrient levels, the cultures help maintain balanced water chemistry and prevent eutrophication.

2. **Breakdown of Organic Pollutants and Sludge:** Beneficial microbes actively decompose organic waste, sludge, and other pollutants. This natural breakdown process reduces Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), resulting in cleaner, clearer water and less buildup at the waterbody's bottom.

3. **Algae Suppression:** By outcompeting algae for nutrients, these microbial cultures effectively prevent excessive algae growth, ensuring that waterbodies remain clear and healthy. This helps to maintain oxygen levels, supporting fish and other aquatic life.

4. **Odor and Color Reduction:** The microbial activity reduces unpleasant odors and murky color by breaking down the organic compounds that cause them. This leads to more visually appealing and pleasant-smelling water, enhancing the experience for nearby communities.

5. **Eco-Friendly and Self-Sustaining:** As a natural solution, the microbial cultures work with the waterbody's existing ecosystem, promoting long-term ecological health. Once introduced, they establish self-sustaining bacterial colonies that continue to purify the water with minimal external intervention.

6. **Environmental and Aesthetic Benefits:** Clean-Water's Beneficial Microbial Cultures improve water quality without the need for chemicals, preserving the natural balance of the ecosystem. Healthier, clearer water supports aquatic biodiversity and enhances the visual appeal of waterbodies, making them more inviting for community interaction and recreational activities.

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Microbial cultures, consisting of beneficial bacteria consortia, combat eutrophication by improving water clarity, reducing sludge, and removing excess nutrients. This low-cost solution prevents algae infestations in diverse water environments.

**Benefits**

- Quickly tackles eutrophication in water bodies.
- Improves water clarity and odour within a few days.
- Biologically removes excess nutrients, reducing sludge and silt.
- Safely stops undesirable infestations of algae and water hyacinth.

REDUCES ODOUR

REDUCES COLOR

STOPS INVASIVE SPECIES

REMOVES HARMFUL NUTRIENTS

FISH, AQUATIC LIFE FRIENDLY

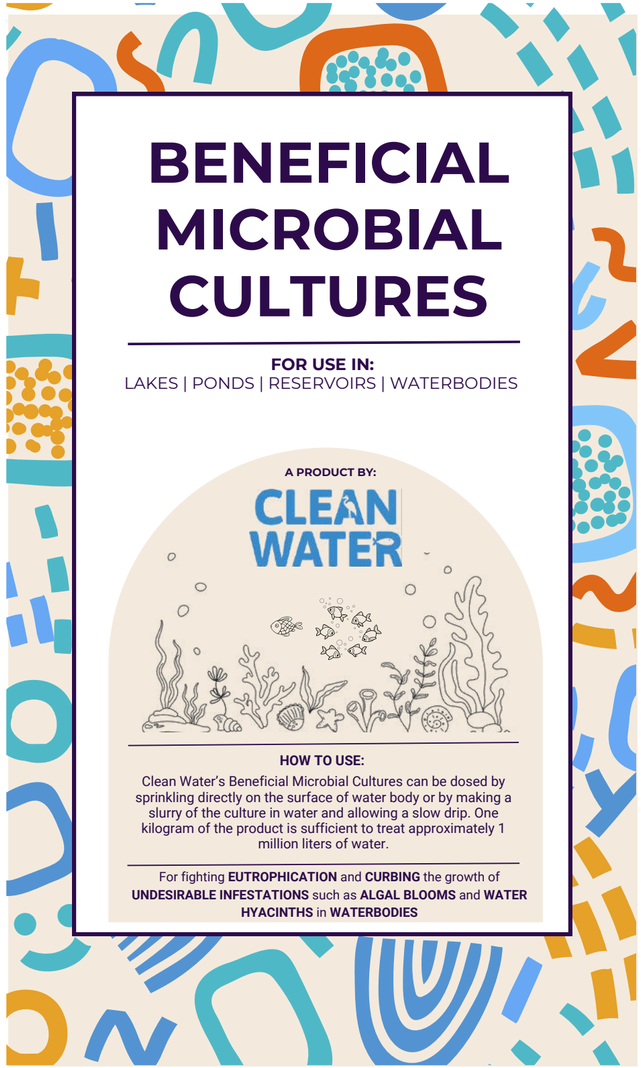
EASY TO DOSE

HUMAN FRIENDLY

BIO ENGINEERED

QUICK RESULTS

COST EFFECTIVE



# BENEFICIAL MICROBIAL CULTURE

CLEAN WATER

## BIOLOGICAL NUTRIENT REMOVAL PROCESS

1) Oxidation

$$COHNS + O_2 + \text{bacteria} \longrightarrow CO_2 + NH_3 + \text{other end products} + \text{energy}$$

2) Synthesis of new cell tissue

$$COHNS + O_2 + \text{bacteria} \longrightarrow C_5H_7NO_2 \text{ (new cell tissue)}$$

3) Endogenous decay or respiration

$$C_5H_7NO_2 + 5O_2 \longrightarrow 5CO_2 + 2H_2O + NH_3 + \text{Energy}$$

4) Anaerobic Fermentation

$$\text{Complex Organic Matter} \longrightarrow \text{Soluble Organic Molecules} \longrightarrow 3CH_4 + CO_2$$

5) Biological Nitrogen Removal in the form of Nitrogen gas

(i) Nitrification $NH_3 + O_2 \longrightarrow NO_2^- + 3H^+ + 2e^-$

$$NO_2^- + H_2O \longrightarrow NO_3^- + 2H^+ + 2e^-$$

(ii) Denitrification in this process $NO_3^-$ is converted to nitrogen gas ($N_2$) by denitrifying bacteriaa These are heterotrophic bacteria which need organic matter as a source for carbon.

$$2NO_3^- + 10e^- + 10H^+ \longrightarrow N_2 + 6H_2O$$

**Analysis of the Chemical Processes**

This set of reactions describes the main biochemical processes that beneficial microbial cultures facilitate in polluted waterbodies to break down pollutants, reduce nitrogen levels, and improve water quality.

**1. Oxidation:** Organic compounds (COHNS) are broken down by bacteria with oxygen, releasing carbon dioxide ($CO_2$), ammonia ($NH_3$), and energy. This helps reduce organic pollutants, with bacteria using the energy for growth.

**2. Synthesis of New Cell Tissue:** Bacteria consume organic material and oxygen to produce new cell tissue ($C_5H_7NO_2$), allowing them to multiply and continue processing pollutants.

**3. Endogenous Decay or Respiration:** Bacteria use their stored compounds in the absence of nutrients, releasing $CO_2$, $H_2O$, $NH_3$, and energy. This stabilizes the bacterial population and further reduces pollutants.

**4. Anaerobic Fermentation:** In low-oxygen conditions, complex organic matter is broken down into methane ($CH_4$) and $CO_2$ by anaerobic bacteria. This helps reduce sludge

**5. Biological Nitrogen Removal:**

- Nitrification: Ammonia ($NH_3$) is oxidized to nitrate ($NO_3^-$) through nitrite ($NO_2^-$), converting toxic ammonia into a safer form.
- Denitrification: Nitrate is converted to nitrogen gas ($N_2$) by denitrifying bacteria, removing excess nitrogen and preventing nutrient overload.

# BENEFICIAL MICROBIAL CULTURE

## Dosing

### Direct/Shock Load

Directly sprinkle the prescribed amount on the surface of the water. For best results, please sprinkle at different places on the surface and near any inlets.

### Indirect/Timed Release

Obtain a 200 litre drum with a tap at the bottom. Dilute the prescribed dosage in the drum with water from the water body. Open tap slightly to achieve the prescribed rate of dosing. For best results, place the drum near an inlet to the water body.

**Consult with our experts to learn about the right dosing technique for your water body.**