# ROLE OF MICROBES IN SEWAGE AND DOMESTIC WASTE WATER TREATMENT SYSTEMS:

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The major microbial populations found in wastewater treatment systems are bacteria, protozoa, viruses, fungi, algae and helminthes. The presence of most of these organisms in water leads to spread of diseases.

## **Bacteria:**

Bacteria are of the greatest numerical importance in wastewater treatment systems. The majority is facultative living in either the presence or absence of oxygen. Although both heterotrophic and autotrophic bacteria are found in wastewater treatment systems the predominant ones are the heterotrophic bacteria. Generally, heterotrophic bacteria obtain their energy from the carbonaceous organic matter in wastewater effluent. The energy obtained is used for the synthesis of new cells and also for the release of energy through the conversion of organic matter and water. Some important bacteria genera that are found in wastewater treatment systems are *Achromobacter*, *Alcaligenes, Arthrobacter, Citromonas, Flavobacterium, Pseudomonas, Zoogloe* and *Acinetobacter*.

In wastewater treatment systems, bacteria are responsible for the stabilization of influent wastes. The majority of the bacteria are known to form floc particles. The floc particles are clusters of bacteria that break down waste. The floc particles also serve as sites on which waste can be absorbed and broken down. Filamentous bacteria form, whose trichomes or filaments provide a backbone for the floc particles, allowing the particles to grow in size and withstand the shearing action in the treatment process. When filamentous bacteria are present in excessive numbers or length, they often cause solid/liquid separation or settle ability problems.

## Protozoa:

Protozoa are microscopic, unicellular organisms that are also found in the wastewater treatment systems. They perform many beneficial functions in the treatment process, including the clarification of the secondary effluent through the removal of bacteria, flocculation of suspended material and as bio-indicators of the health of the sludge.

In wastewater treatment systems, protozoa are useful biological indicators of the condition of the systems. Protozoa to be excellent indicator of an aerobic environment. Additionally, they serve as indicators of a toxic environment and are capable of exhibiting greater sensitivity to toxicity than bacteria. The presence of large numbers of highly evolved protozoa in the biological mass in a wastewater treatment system is indicated as a hallmark of a well-operated and stable system.

The species of protozoa most commonly observed in wastewater treatment processes include *Aspidisca costata, Carchesium polypinum, Chilodonella uncinata, Opercularia coarcta, Opercularia microdiscum, Trachelophyllum pusillum, Vorticella convallariaand, Vorticella microstoma.* 

## Fungi:

Fungi are also part of the microorganisms found in wastewater treatment systems. The most common sewage fungus organisms are *Sphaerotilus natans* and *Zoogloea* sp. A number of filamentous fungi are found naturally in wastewater treatment systems as spores or vegetative cells, although they can also metabolize organic substances. A number of fungi species, such as *Aspergillus, Penicillium, Fusarium, Absidia* and a host of others have been implicated in the removal of carbon and nutrient sources in wastewater.

## Algae:

Algae can be found in wastewater because they are able to use solar energy for photosynthesis as well as nitrogen and phosphorus for their growth leading to eutrophication. Some types of algae that can be found in wastewater include *Euglena* sp., *Chlamydomonas* sp., and *Oscillatoria* sp. Algae are significant organisms for biological purification of wastewater because they can be able to accumulate plant nutrients, heavy metals, and pesticides, organic and inorganic toxic substances. The use of microalgae in biological wastewater treatment has gained a lot of importance over the years.

## Helminth:

Nematodes are part of the ecosystem, serving as food for small invertebrates. They crawl onto floc particles and move in whip-like fashion when in the free-living mode. They secrete a sticky substance to be able to anchor to a substrate (media), so that anchored nematodes can feed without interference from currents or turbulence. A lack of nematode activity can be one of the bio-indicators of a toxic condition that may be developing in the treatment process.

## Virus:

Enterovirus and Rotavirus are excellent indicators of human fecal contamination in wastewater. These viruses are detrimental to humans, if consumed and causes life threatening diseases such as Polio, Hepatitis A, Diarrhea (Caused by rotavirus). Viruses are removed from wastewater through ozonation, a process of disinfection.