



Microorganisms of Importance

The removal and subsequent treatment of human waste (wastewater) is a fundamental requirement of any community with residents living in close proximity. History has taught us that without it, chronic diseases that can lead to death plague the area. The waste of warm-blooded animals such as humans is the home of quite a few types of bacteria that can really mess up a gastrointestinal tract when ingested. Two of the most common include E. coli and Salmonella, which are not uncommon to hear about in the news when recalling produce. These bacteria and other microorganisms use the “waste” as a source of food and habitat, all while breaking it down to its most stable form.

These microorganisms include bacteria, protozoans, rotifers, aquatic worms, fungi, and algae. Wastewater treatment takes this natural process, increases the volume treated, and speeds up the time needed from weeks to hours. In a plant setting, this culture of organisms is referred to as activated sludge. Activated sludge must maintain a certain balance of organism types and a balance of organisms to food (waste) to work effectively. Constant testing and manipulation of variables are needed to maintain this balance.

The most common type of microorganism found in activated sludge is bacteria. Bacteria reproduce by binary fission (each cell divides into two cells); this can happen every few minutes for some organisms. To better understand how quickly this accumulates, the “Operation of Wastewater Treatment Plants” book state, “Each person eliminates about 200 billion E. coli per day as waste.” Bacteria are considered the main workers of the activated sludge process but are too small to be observed with a light microscope. Instead, the number of bacteria present and the degree of treatment that has occurred is indicated by the types of Protozoa that are either present or absent.

Protozoa are single-celled protists that range in size from 10 microns to over 300 microns and are used as indicator species in wastewater treatment. There are five types we find in wastewater: 1. Amoeba 2. Flagellate 3. Free swimming ciliate 4. Stalked ciliate 5. Suctoria. Of the five types, the indicators of healthy and stable activated sludge are Free swimming ciliates and Stalked ciliates.

As the activated sludge grows older (usually several days), more advanced microorganisms such as Rotifers and Tardigrades appear. Rotifers are an interesting multicellular animal that resembles the giant worms in the 1990 horror comedy movie “Tremors.” A few interesting facts about them are that most are female, and there are over 2,200 different species. Tardigrades are by far the most fascinating of all the microorganisms we see in activated sludge. Also referred to as “Water Bears,” they can survive in the vacuum of open space and solar radiation combined over ten days and for up to 100 years without water. They are also the highest organism up the activated sludge food chain.

Without the microorganisms mentioned above, treating wastewater would be vastly different and more costly. Since activated sludge is a living biological process, it gives up excellent insight into the health and well-being of the system. The presence or absence of key species can alert us to problems beginning to occur with the treatment process. This knowledge is very valuable in preventing system upsets that can lead to permit violations.

The subject of microorganisms and how they benefit or harm larger organisms is a standard listed in the GPS for 5th grade. We offer a “Marvelous Microbes” program that addresses this standard.

For this and other educational programs, please visit <https://ccwsa.com/education>. We also offer water and wastewater plant tours by request throughout the year.

For more information, contact Public Information Specialist Lori Forrester @ lori.forrester@ccwsa.com.

