Archaea’s role in wastewater treatment plants

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Introduction

Wastewater treatment plants (WWTP) reduce organic content of wastewater, remove toxic compounds and inactive microorganisms and parasites. Activated sludge and biofilm-based technologies are analysed to know the diversity of archaea and which roles do they have in them.

Most relevant results

Ammonia-oxidising archaea (AOA) occur in alternation of aeration conditions, with low DO and long solids and hydric retention times.

Factors affecting diversity

- Temperature
- Dissolved oxygen concentration (DO)
- Chemical composition of water

Biofuelling

The prevalent populations are related to Methanospirillaceae and Methanosaeta spp.

Diversity in activated sludge

The most represented sequence is Methanoseta spp. It is suggested that ARC I and M. concilii compete for acetate.

Diversity in biofilm-based digestors

Methanogens are the main population. The most common hydrogenotrophic methanogens are M. thermoautotrophicus and Methanoculleus thermophilicum. The most common acetoclastic methanogens include Methanosarcina thermophila and thermoophilic Methanoseta.

Conclusions and future perspectives

- There are still lots of challenges:
  - Why methanogens are so common in WWTP
  - Survival skills
  - Contribution to biofilms
- AOA must be studied by their activity, not the presence of the gene amoA
- Abundance does not give information about roles, as activity is not always related to quantity.
- Methanoseta is the most common species in both types of WWTP
- Inhibition of quorum sensing may help fighting biofouling

REFERENCES


State of art

What do we expect to find?

Ammonia-oxidising archaea

Microorganisms belonging to Thaumarchaeota phylum and participate in ammonia oxidation to nitrite.

Biofilms

They will be found in granules (biofilm-based system), they are formed by archaea and bacteria. Biofilms are also formed in membrane bioreactors (MBR), causing biofouling.