

Diversity profile of microbes associated with anaerobic sulfur oxidation in an upflow anaerobic sludge blanket reactor treating municipal sewage

ABSTRACT

We herein analyzed the diversity of microbes involved in anaerobic sulfur oxidation in an upflow anaerobic sludge blanket (UASB) reactor used for treating municipal sewage under low-temperature conditions. Anaerobic sulfur oxidation occurred in the absence of oxygen, with nitrite and nitrate as electron acceptors; however, reactor performance parameters demonstrated that anaerobic conditions were maintained. In order to gain insights into the underlying basis of anaerobic sulfur oxidation, the microbial diversity that exists in the UASB sludge was analyzed comprehensively to determine their identities and contribution to sulfur oxidation. Sludge samples were collected from the UASB reactor over a period of 2 years and used for bacterial 16S rRNA gene-based terminal restriction fragment length polymorphism (T-RFLP) and next-generation sequencing analyses. T-RFLP and sequencing results both showed that microbial community patterns changed markedly from day 537 onwards. Bacteria belonging to the genus *Desulforhabdus* within the phylum Proteobacteria and uncultured bacteria within the phylum Fusobacteria were the main groups observed during the period of anaerobic sulfur oxidation. Their abundance correlated with temperature, suggesting that these bacterial groups played roles in anaerobic sulfur oxidation in UASB reactors.

Keyword: Anaerobic sulfur oxidation; Microbial diversity; Next-generation sequencing; UASB reactor; Wastewater treatment