



The existence and role of ammonia-oxidizing archaea in full-scale wastewater treatment plants

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ABSTRACT

The study investigated the richness and occurrence of archaeal and bacterial amoA genes in activated sludge samples from ten industrial and six domestic wastewater treatment plants (WWTPs). Three different strains of ammonia-oxidizing archaea (AOA) were grown as enrichment cultures to determine the optimal growth of ammonium concentrations. AOA growth was greatly retarded at ~10 mM and inhibited at ~20 mM ammonia concentrations. ASAT 1 WWTP had the highest abundance of the AOA amoA gene (5.83×10^7), but the copy number of ammonia-oxidizing bacteria (AOB) amoA genes was 5.17×10^4 . İSTAC leachate WWTP, which contained the highest ammonia level (104.6 mM) within the samples, had AOA amoA gene copy (1.39×10^4) less than four orders of AOB amoA gene copy (1.34×10^8). The results of this study indicated that AOA may participate ammonia oxidation in domestic WWTPs. Most of the sequences were closely clustered among a marine archaeon (Group 1.1a). Fewer sequences were affiliated with a soil archaeon (Group 1.1a).

Keywords: Ammonia-oxidizing bacteria; Ammonia-oxidizing archaea; Wastewater treatment; Quantitative PCR; Nitrification

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