Session: Biofilm application

Changes of ANAMMOX biofilm under stepwise increased ciprofloxacin stress

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Anaerobic Ammonium oxidation (ANAMMOX) is a microbially mediated technology for the treatment of nitrogen-rich waste waters, such as monosodium glutamate waste water and landfill leachate. Wastewater treatment plants (WWTPs) are continuously exposed to sub-inhibitory concentrations of antibiotics that are thought to contribute to the spreading of antibiotic resistant bacteria and antibiotic resistance genes, which are eventually released to downstream environments through effluents. The sub-inhibitory effect of the quinolone ciprofloxacin (CIP) was evaluated through a batch reactor operation for 70 days to estimate specific anammox activity and microbial community alterations. The application of CIP ranged from 10 µg/L (about twenty times the typical ciprofloxacin concentration observed in municipal wastewater) to 500 µg/L. The performance of the anammox reactor decreased significantly after the 100µg/L mark. Total nitrogen removal efficiency and ammonium removal efficiency decreased ~50% after 100 µg/L CIP application. On the other hand, Nitrite concentration in the reactor increased significantly due to inhibitory effects. Further, the abundance of ciprofloxacin resistant bacteria (ARB) and antibiotic resistant genes (ARGs) that confer to resistance to quinolones (such as qnrA, qnrB, qnrD, qnrS, arcA,16S rDNA), showed significant increase at 100 µg/L and a decrease at 500 µg/L due to inhibition of overall community abundance.