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Effects of salinity on the nitrogen removal efficiency and bacterial community structure in fixed-bed biofilm CANON bioreactors

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Title: **Effects of salinity on the nitrogen removal efficiency and bacterial community structure in fixed-bed biofilm CANON bioreactors**

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Abstract

The discovery of anaerobic ammonium oxidation processes led to the development of innovative nitrogen removal technologies, which are more cost-effective and environmentally friendly than conventional activated sludge systems. In this study, the bacterial community structure was determined as well as the nitrogen removal efficiencies in four fixed-bed biofilm bioreactors, working under different salt concentrations (0, 3, 25, and 45 g L⁻¹ of sodium chloride (NaCl)) and at hydraulic retention times (HRT) of 6 and 12 h. The influent total nitrogen concentration was 250 mg L⁻¹. The results showed a clear inhibition in the nitrogen removal capacity of the process that was directly related to the salt concentration in the influent, most likely due to changes in the bacterial community structure; increases in the NaCl concentration provoked the inhibition of *Candidatus Brocardia* and *Nitrosomonas*, whereas heterotrophic phylotypes such as *Marinobacter* proliferated. An evident adaptation of the anammox microorganisms at 3 g NaCl L⁻¹ was observed, whereas ammonia and nitrite oxidizing bacteria drastically decreased at 25 and 45 g NaCl L⁻¹. Total nitrogen efficiencies for 6h of HRT were 87.68, 64.25, 38.79, and 19.74%, for 0, 3, 25, and 45 g NaCl L⁻¹, respectively. No significant effects were detected on the performance of the bioreactors and bacterial

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