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# Coupling of the Feammox - Anammox pathways for nitrogen removal

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Nitrogen (N) is essential for life, forming parts of proteins and nucleic acids, and is a key component of fertilizers. However, human activities such as industrial processes, agriculture, and fossil fuel combustion have disrupted the N cycle, causing environmental issues like water eutrophication, soil acidification, and atmospheric pollution. This study explores the classic anaerobic ammonium oxidation process (Anammox) coupled to the iron-dependent anaerobic ammonium oxidation process (Feammox) in a sequential discontinuous bioreactor (SBR) for ammonium ($NH_4^+$) removal. Feammox and Anammox cultures were individually enriched and combined, optimizing the coupling, and identifying key variables influencing the enrichment process. Adding sodium acetate as a carbon source significantly reduces $Fe^{3+}$ to $Fe^{2+}$, indicating Feammox activity. Both Anammox and Feammox processes were successfully operated in SBRs, achieving efficient $NH_4^+$ removal (Anammox: 64.6 %; Feammox: 43.4 %) (Fig 1). Combining these pathways in a single SBR enhances the $NH_4^+$ removal capacity of 50.8 %, improving Feammox efficiency. The Feammox process coupled with Anammox may generate the nitrite ($NO_2^-$) needed for Anammox. This research contributes to biotechnological advancements for sustainable nitrogenous compound treatment in SBRs.