Resilience of nitrogen-removing anammox bacteria to nutrient starvation

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Video Byte

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Abstract

Nitrogen removal is a critical part of the wastewater treatment process, and one of the most efficient ways to remove nitrogen from water is anaerobic ammonium oxidation (anammox). Anammox is a process mediated by bacteria that – via several biochemical steps – converts ammonium to nitrogen gas. Understanding how external factors like nutrient availability impact these organisms can help us optimize and maintain these systems. A recent study found that the anammox bacterial communities are resilient to short-term starvation. The community structure changed slightly, and the bacteria increased expression of important nutrient transporters and energy metabolism genes. Expression of key genes associated with anammox reactions were also increased in response to starvation. The anammox bacteria showed fewer differences in transcriptional patterns after starvation than heterotrophs, suggesting that the anammox bacteria had greater transcriptional resilience than the heterotrophs. Synergistic responses, such as sharing metabolic intermediates, between heterotrophs and anammox bacteria helped the community survive and recover. This study suggests that the anammox bacterial community is resilient to starvation stress and these findings will be beneficial to the understanding of the capacity of anammox bacterial community in response to stress and process stability in engineered ecosystems.