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Microbial population dynamics in continuous anaerobic digester systems during start up, stable conditions and recovery after starvation.

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Abstract

The evolution and population dynamics of complex anaerobic microbial communities in anaerobic digesters were investigated during stable operation and recovery after prolonged starvation. Three thermophilic reactor systems fed with cattle manure were operated continuously in parallel for 167 days. Significant changes in the microbial communities were observed for both the bacterial and archaeal populations as the reactor systems were subjected to changing feeding regimes. The ecosystems developed from being relatively similar in structure to more specialised communities, with large population shifts within the acetogenic and methanogenic communities, which appeared to shift towards the hydrogenotrophic methanogenesis pathway. All reactor systems showed signs of adaptation to a harsher environment under high VFA, H₂S and ammonia concentrations, but remained at a lower degree of stability after 45 days of recovery compared to stable period of operation before starvation.

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