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CHEMOLITHOTROPHIC DENITRIFICATION IN NITRATE-INDUCED ANOXIC MARINE SEDIMENT REMEDIATION AND ISOLATION OF AST-10 A NOVEL THIOMICROSPIRA DENITRIFICANS-LIKE BACTERIAL STRAIN

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Background: During nitrate-induced sediment remediation, chemolithotrophic bacterial coupling sulfide oxidation and nitrate reduction dominated the microbial community.

Objectives:

1. Characterization of the chemolithotrophic denitrification process during sediment remediation.
2. Isolation and characterization of AST-10 a novel Thiomicrospira denitrificans-like bacterial strain.

Methods:

Microbial community: 16S rDNA based approaches;

Morphology: SEM & TEM.

Results:

1. By adding nitrate to anoxic sulfide-rich marine sediment, the activities of chemolithotrophic denitrifiers were stimulated to oxidize sulfide to sulfate and reduce nitrate to dinitrogen and nitrous oxide. The chemolithotrophic denitrification accounted for over 70% of total nitrate reduction.
2. Through DGGE analysis, two major species responsible for chemolithotrophic denitrification were identified. One was phylogenetically related with Thiomicrospira paralvinellae and Thiomicrospira denitrificans, and the other closely related to Thiohalophilus thiocyanoxidans. Using a primer set designed specifically for Tm. denitrificans, six new Tm. denitrificans-like OTUs were identified by cloning-sequencing. They had >97% similarity with Tm. denitrificans and its relatives.
3. AST-10 a novel Thiomicrospira denitrificans-like bacterial strain was isolated from nitrate treated sediment and deposited in DSMZ as DSM 22096. AST-10 can utilize hydrogen gas, thiosulfate and sulfide as its electron donor under anaerobic conditions. The morphology of this strain was determined by electron microscopy.

Conclusions:

1. The chemolithotrophic denitrification, was found to be the major denitrification process in this study. Thiomicrospira denitrificans-like species dominated the whole microbial community.
2. AST-10 a novel Thiomicrospira denitrificans-like bacterial strain capable of using hydrogen gas, thiosulfate and sulfide as its electron donor was isolated and characterized.